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Swine Production
in
Alberta

by

Department of Animal Science

FACULTY OF AGRICULTURE
UNIVERSITY OF ALBERTA
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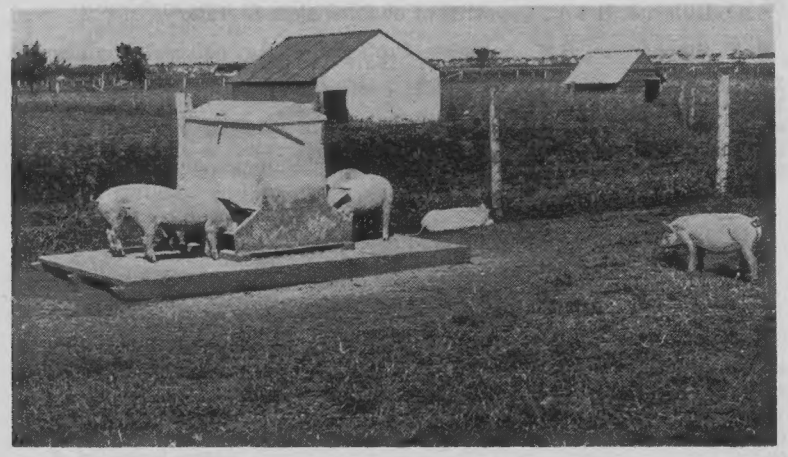
UNIVERSITY OF ALBERTA
FACULTY OF AGRICULTURE

Swine Production in Alberta

BY

DEPARTMENT OF ANIMAL SCIENCE



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BEAR IN MIND

1. **Pigs will produce more meat from 100 pounds of farm-grown feed than any other farm animal.**

2. **Pigs will eat and grow and finish on a greater variety of feeds than any other animal on the farm.**

3. **Pigs multiply rapidly so that the money invested in a sow is returned quickly.**

4. **Pigs constitute a reliable source of revenue and provide the farm table with a high-class meat product.**

5. **Over 12,000,000 hogs, or almost one-quarter of Canada's total production, were marketed in Alberta during the 10 years 1946 to 1955.**

6. **Success in pig raising depends upon the use of breeding stock of the right kind, together with good feeding and management methods.**

7. **Alberta-grown grains—oats, barley and wheat—when properly supplemented will produce as good bacon hogs as can be produced anywhere in the world.**

8. **Pigs should be kept year in and year out. Over a period of years they will provide a profitable outlet for farm-grown grains and farm by-products.**

9. **Control of disease and parasites is essential to success in pig raising. Diseased pigs and those infested with worms are a liability rather than an asset.**

PREFACE

Since the swine herd was established at the University of Alberta in 1917, some 16,500 pigs have been farrowed. These pigs have been utilized in a variety of ways. Some have been shipped throughout the Province to assist in improving the quality of commercial pigs, many have served as material for student judging classes, but the majority have been used for experimental purposes.

During the past 39 years more than 175 swine feeding experiments have been conducted. Information has been gathered on a wide variety of feeding problems. The object in conducting these experiments has been to gather information which would be of value to the hog producers of Alberta and to assist in establishing principles which would have an application to swine production in any country.

The material which is presented in this bulletin is based largely on results of experiments conducted at the University of Alberta. Information regarding swine equipment and nutritional diseases has also been included. It is hoped that the bulletin will prove helpful to swine raisers and that it will assist in the production of better and more profitable hogs in Alberta.

The first edition of Bulletin 22, Swine Production in Alberta, was published in 1932. Popular demand for the bulletin dictated the preparation of revised up-to-date editions in 1934, 1937, 1939, 1941, 1945, 1948 and 1952. Prior to the release of this, the ninth edition, some 39,000 copies were distributed to farmers and others interested in the swine industry.

Swine Production in Alberta

BY

J. P. BOWLAND, R. T. BERG AND L. W.McELROY

Department of Animal Science

INTRODUCTION

Since the earliest homesteading days pig raising has constituted a worthwhile phase of Alberta's agriculture. Those whose occupation of Alberta's lands preceded the development of established markets found the pig a good source of food supply and a means of converting unmarketable grains into a commodity that had a cash value. We find the pig playing much the same role after approximately sixty years of agricultural evolution in this Province, only in the interval annual revenue from pig sales has risen from a few thousand dollars to many millions and pork products processed in Alberta packing plants find their way to the markets of the world. It may be recorded that during 1944, when Alberta marketed approximately 3,000,000 head of hogs she attained the distinction of being the unit in the British Empire which contributed the largest volume of bacon to the people of Great Britain in a time of great need. Alberta requires approximately 425,000 hogs for her own use. Average annual production over the past 5 years has been almost 1,400,000 hogs so that approximately 70% of the total pork produced has been sold outside the Province.

In addition to supplying a high-class meat product the pig is second-to-none as a converter of high grade as well as low grade grains into a concentrated, relatively low freight rate commodity. In times of high grain prices the value of the pig in the farm economy is not usually appreciated, but when prices decline, when quotas limit the amount of grain which can be marketed, or when grades are lowered as a result of frost or other damage the value of this class of livestock is brought markedly to the fore. As will be indicated in the discussion which follows, the Alberta farmer who has kept pigs year in and year out, either as a sideline or as a major part of his farm enterprise, has little reason to be discouraged with the results in terms of financial returns.

The estimated value of the 6,932,757 Alberta hogs marketed during the 5-year period 1951-55 was $295,899,331 or $59,179,866 annually, a sum which is significant in relation to farm buying power.

It is of interest to note Alberta's position in relation to the other provinces in Canada in the matter of swine population. According to the most recent statistics available, the various provinces rank as follows from the standpoint of swine marketed:

TABLE I.—ESTIMATED NUMBER AND VALUE OF SWINE MARKETED IN CANADA, 1955
(including hogs shipped on export)

Province	Number	Value $
Ontario	1,998,742	80,609,265
Alberta	1,691,193	60,324,854
Quebec	1,057,236	42,257,723
Saskatchewan	562,412	19,453,831
Manitoba	435,517	15,844,108
New Brunswick, Nova Scotia, Prince Edward Island	138,348	5,529,770
British Columbia	40,810	1,512,011
Total	5,924,258	225,531,562

Since 1953 Alberta has stood second among the provinces in Canada in the number of swine sold and it may be suggested that her position is likely to be strengthened in the years that lie ahead. Conditions are favorable for swine raising in the Province from the standpoint of volume, quality and continuity of feed supply, particularly in the mixed farming area. It is important that swine raisers realize Alberta's status in this field because it is clear that they have an important responsibility as contributors to Canadian pork supply for home or export consumption. The number of hogs originating in this Province materially affects the quality of Canadian pork products and it, therefore, behooves Alberta producers to pay careful attention to improvement in quality.

IS HOG RAISING IN ALBERTA PROFITABLE?

It is appropriate, early in the discussion of swine production problems in Alberta, to consider whether the pig business in this Province is on a sound economic footing. Our interest in what will follow, and in fact our interest in pig raising generally, in terms of a long time program, may hinge on this point. A review of what has taken place in the years which have passed will prove valuable in this connection and may point the way to what may be expected to happen in the years that lie ahead.

In considering the economic status of the hog business, it seems necessary to attempt to relate the cost of production to the selling price over a period of years and thereby show the number of years when hogs have been good property and the number when they could be considered a liability.

We have records for the years 1918 to 1955 inclusive. This span of thirty-eight years includes periods of world war, post war recovery, depression and prosperity. It thus covers a sufficient variety

of conditions to yield a result which should prove a valuable guide in laying plans in connection with a swine raising enterprise.

Two main factors enter into the cost of producing hogs: (a) overhead cost, and (b) feed cost. At the University of Alberta, in an attempt to estimate the cost of producing 100 pounds live weight of hog, we have taken four sows as a farm unit and have calculated on the basis of seven pigs raised per litter with all sows farrowing in the spring and two farrowing again in the fall, or, in other words, six litters of seven pigs or forty-two pigs marketed during the year. Charging interest at six per cent on the money invested in breeding stock, buildings and equipment, and on the value of the land used for pasture, allowing for 5% and 10% depreciation on buildings and equipment respectively, charging pasture on the basis of cost of seeding, and providing for a $3.00 to $4.50 labor return per pig, as well as compensation for delivery of pigs to market, we estimated an *overhead cost* of hog production. This figure has varied from time to time depending upon depreciation in values of breeding stock and other items as well as the labor return. The range has been from a high of $11.31 per market hog during 1954 and 1955 to a low of $4.30 per hog during the 1930's.

From the results of numerous experiments with pigs under various conditions, we conclude that 450 lb. of grain or its equivalent are required to produce 100 lb. of live hog. A 200 lb. hog will require 900 lb. of grain; this will make provision for the feed for the sow during the pregnancy and suckling period. Some may feel that this figure should be higher but the figure of 900 lb. will apply where the system of feeding and management is reasonably satisfactory. On farms where proper supplements are not used the figure will run much higher (see page 46).

If the yearly average cash grain price, in cents per pound, of a mixture of equal weights of oats and barley, multiplied by 450, is taken as the *feed cost,* and the *overhead* figure is added to this, we arrive at the yearly average *cost of producing hogs.* When this figure is related to the average yearly price of the basic grade of hogs, we can study the cost of production in relation to selling price.

Table II sets out the average yearly selling prices of hogs on the Edmonton market from 1918 to 1955, together with the average yearly costs of production over the same period. In connection with production costs, grain was charged at Edmonton cash grain prices for No. 1 Feed barley and oats. Hog prices were based on the "thick smooth" grade for the years 1922 to 1929, on the "bacon" grade from 1930 to 1940, and on B_1 carcass prices plus premium converted to live hog prices from 1941 to 1955.

A study of Table II will show:

(1) The average Edmonton price of the basic grade of hogs over the thirty-eight year period from 1918 to 1955 was $12.87 per 100 lb. live weight.

(2) The average cost of producing 100 lb. live weight of hog over the same period was $9.25.

(3) During this thirty-eight year period pigs paid all overhead costs, including interest on breeding stock, buildings and equipment, took care of depreciation, paid a labor return and marketing charges, and provided for a margin of $3.62 per 100 lb. or approximately $7.25 per hog between the cost of production and selling price.

TABLE II.—HOGS RETURN A PROFIT

Year	Selling Price of Basic Grade Hogs	Cost of Production	Difference
	Basis 100 lb. Live Weight		
1918	$19.31	$13.61	$ 5.70
1919	20.53	12.79	7.74
1920	18.68	14.95	3.73
1921	12.11	8.34	3.77
1922	10.33	7.79	2.54
1923	8.39	7.33	1.06
1924	7.45	8.50	—1.05
1925	11.58	9.22	2.36
1926	12.48	8.10	4.38
1927	10.08	9.66	.42
1928	9.34	9.26	.08
1929	11.20	9.00	2.20
1930	10.66	6.38	4.28
1931	6.01	3.94	2.07
1932	3.45	3.92	— .47
1933	4.80	4.49	.31
1934	7.45	5.62	1.83
1935	7.72	5.45	2.27
1936	7.71	5.42	2.29
1937	8.15	7.08	1.07
1938	8.88	5.74	3.14
1939	8.33	4.63	3.70
1940	7.81	5.51	2.30
1941	8.86	6.32	2.54
1942	10.66	8.35	2.31
1943	11.70	9.30	2.40
1944	12.86	10.23	2.63
1945	13.16	10.29	2.87
1946	13.88	10.47	3.41
1947	15.54	11.51	4.03
1948	21.75	12.34	9.41
1949	22.95	13.79	9.16
1950	22.07	14.66	7.41
1951	25.36	14.30	11.06
1952	19.06	13.81	5.25
1953	20.90	12.81	8.09
1954	21.52	13.13	8.39
1955	16.47	13.40	3.07
Average	12.87	9.25	3.62

Av. Edmonton Price No. 1 Feed barley (1918-55):	
Marketed through hogs (net)	$1.02
Marketed direct	0.62
Difference	0.40

(4) During this thirty-eight year period there have been only two years, 1924 and 1932, in which the average cost of production for the year has exceeded the selling price. This condition existed for all 12 months of 1924 and for 9 months in 1932. In the remaining

36 years of this period there have been only occasional months in which the cost of production has exceeded the average selling price.

(5) An alternative method of estimating the profits realized from hogs is to calculate the return obtained for a bushel of grain marketed through the feedlot route and compare this with the cash or Wheat Board payment for grain. This estimate has been made year by year on a "net" basis; i.e. after deducting from the gross returns an overhead charge of from $4.30 to $11.31 per hog to cover items listed in (3) above. The average Edmonton cash price (since 1949 the total Wheat Board payment) for No. 1 Feed barley over a thirty-eight year period has been 62 cents per bushel, whereas this grain was marketed through hogs at $1.02 per bushel. *The barley was increased in value 65% by marketing as pork instead of as grain.*

The swine business in Alberta has been on a sound economic footing. No business can be judged on one year's operation, and there are few enterprises that do not show occasional "loss" years. The Alberta farmer who makes pig raising a part of his regular farming program over a period of years will find the business profitable rather than unprofitable. The individual who attempts to run pigs on the "in and out" plan is very apt to find the results disappointing as he is likely to be in when he should be out and out when he should be in. The "in and out" policy disturbs the marketing situation and gives rise to a condition of instability that is detrimental to regular producers. The man who keeps pigs regularly, slightly raising or lowering the number of brood sows as changes in the market may be foreseen, is the one who contributes to permanency in the pig business, and is the one who has a class of stock on hand which can satisfactorily utilize grain of either good or poor quality.

Value of Efficient Feeding

When the feed requirement is lowered as a result of efficient feeding, the net price received for grain is increased while a lower price is obtained when the amount of feed required is high.

As a guide to the net returns which may be expected for grains when hogs sell at different prices, and in order to indicate the influence on returns of the amount of feed required to produce 100 lb. of live weight gain, Table III is submitted. An overhead charge of $5.00 per 100 lb. of live hog was used in calculating the net returns shown in this table.

TABLE III.—NET RETURNS FOR GRAIN WHEN MARKETED THROUGH HOGS

	$	$	$	$
Market price of hogs—per 100 lb. live weight	12.00	16.00	20.00	24.00
Market price of hogs—per 100 lb. dressed weight	16.00	21.35	26.65	32.00
Net returns for grain allowing 400 lb. of grain or its equivalent for 100 lb. live weight gain:				
Net value per bushel grain fed:				
Wheat	1.05	1.65	2.25	2.85
Oats	.60	.94	1.28	1.62
Barley	.84	1.32	1.80	2.28
Net returns for grain allowing 450 lb. of grain or its equivalent for 100 lb. live weight gain:				
Net value per bushel grain fed:				
Wheat	.93	1.47	2.00	2.53
Oats	.53	.83	1.13	1.44
Barley	.75	1.17	1.60	2.03
Net returns for grain allowing 500 lb. of grain or its equivalent for 100 lb. live weight gain:				
Net value per bushel grain fed:				
Wheat	.84	1.32	1.80	2.28
Oats	.48	.75	1.02	1.29
Barley	.67	1.06	1.44	1.82

Monthly Variations in Marketing

A situation which affects the business of processing hogs and presents a problem in connection with continuity of supply of pork products is the variation in volume of hogs marketed from month to month. As a general rule, a much larger number of hogs is marketed during the fall and early winter months than during the summer months. Regularity of supplies is very desirable, and anything that can be done in connection with arranging for farrowing fairly steadily throughout the year will contribute to an even flow of hogs to the packing plants. There has been considerable improvement in Alberta in this respect during recent years. Better farrowing quarters, treatment for anemia and inside feeding have all contributed to this betterment in our performance. We must continue in our efforts to still further improve our position in this respect. The only practical way to compensate for monthly fluctuations in slaughterings is to put bacon in cold storage and this will lead to a lowering of the net returns.

Winter Pigs Pay Their Way

During the period from 1922 to 1956 approximately 6,000 pigs have been farrowed during the fall, and grown and finished during the winter months, at the University of Alberta. The majority of these pigs have been used in experiments regarding the feeding and management of pigs finished during the winter months, and in addition the economics of the business has been carefully checked. Over this period, pigs grown out during the winter and marketed during the spring months have returned a satisfactory profit over and above feed costs, after labor and investment in the pigs and

equipment were charged against the operation. The margin between cost of production and selling price has varied year by year depending upon the relationship between hog and grain prices, but over a period of years the second litter has proven profitable.

It has been demonstrated clearly in our winter experiments, however, that the feeding of protein, mineral and vitamin supplements is a necessity if economical gains are to be made. The large number of inquiries which we receive each year during the late winter months, regarding slow gains and "crippling" among winter pigs, indicate that more attention must be paid to better balanced rations. (See pages 38 to 50.)

QUALITY AND MARKET OUTLETS

A matter of great concern in connection with the production of any class of livestock is that of available markets for the product.

From 1951 to 1955 the average annual consumption of pork in Canada was approximately 60 pounds per person, or the produce of 6¼ million market hogs. These figures are significant in that they emphasize the importance of our home market, which in recent years has absorbed approximately 90% of all carcasses graded.

The Canadian consumer prefers lean cuts of pork and bacon. Possibilities in the way of export markets are at present limited but there is nothing to indicate that satisfactory export outlets can be developed on anything other than a quality basis.

Packers can, to a degree at least, make a lean carcass from a fat one by trimming off surface fat, but fat is, and appears destined to continue to be, a drug on the market. Processed lard has for some years been selling for less per pound than it cost as carcass fat. In the final analysis the consumer makes up the difference by paying more for table pork.

In periods of high income and high prices for competitive meats Alberta swine producers may be able to enjoy the luxury of producing fat hogs, but under less favorable conditions it seems evident that they must concentrate on the production of hogs that can be processed into attractive bacon and cuts of pork with a minimum of waste in the form of fat trimmings. Good breeding stock, balanced rations and marketing at desirable weights are three important factors in the production of hogs that meet this requirement.

From Table IV it is evident that Alberta has never occupied an enviable position with respect to the percentage of top grade carcasses marketed. In recent years the percentage of grade A carcasses produced has not simply been well below the average for Canada, but lower than that for any other province.

TABLE IV.—TOTAL SWINE GRADED IN CANADA AND IN ALBERTA WITH PERCENTAGES IN TOP GRADE

	No. Graded		Selects 1923-40 Grade A 1941-....	
	Canada	Alberta	Canada	Alberta
			%	%
1923-32 average	2,725,763	642,728	15.8	5.4
1933-42 average	4,182,084	1,239,599	25.6	24.4
1943-52 average	5,665,624	1,504,696	30.4	24.0
1953	5,002,814	1,432,438	27.3	19.9
1954	5,078,715	1,461,770	25.9	18.2
1955	5,916,584	1,685,887	27.1	18.9

BREEDS OF SWINE

Canada has concentrated on the production of high quality bacon carcasses which are characterized by a high proportion of lean meat relative to fat. Certain breeds are inherently more suitable for the production of a high quality carcass than are others. However, there are good and bad individuals within all of the standard breeds and it therefore behooves the producer to select breeding stock wisely with due consideration to records of performance for economic characteristics as outlined on pages 17 to 24. Brief descriptions of breeds which have proven suitable for the production of bacon-type carcasses in Canada are given in the following section, along with some mention of breeds common in the United States.

Yorkshire

The Yorkshire is the most common breed of swine in Canada. It originated in Yorkshire, England. The Yorkshire is a prolific breed and improved strains give a high quality bacon carcass. It is a white pig desired by the packer but, as are other white breeds, it

Fig. 1.—A Yorkshire boar.

it susceptible to sunscald. Whether raised pure or in crosses with other breeds, the Yorkshire is the best breed available in any numbers in Canada at the present time and therefore provides the best base for a successful, commercial hog production enterprise.

English Large White

The English Large White is becoming popular in Canada. It has the same ancestral background as the Yorkshire but is sufficiently unrelated to cross well with that breed. It is reputed to be faster growing and more efficient, but indications are that it is slightly inferior in carcass merit to the better strains of Yorkshire.

Tamworth

The Tamworth is one of the oldest breeds of pigs. It originated in England. The Tamworth is a bacon-type breed with a deep body but lacks length and tends toward a light ham and a heavy shoulder. As a breed the Tamworth is not as prolific as the York-

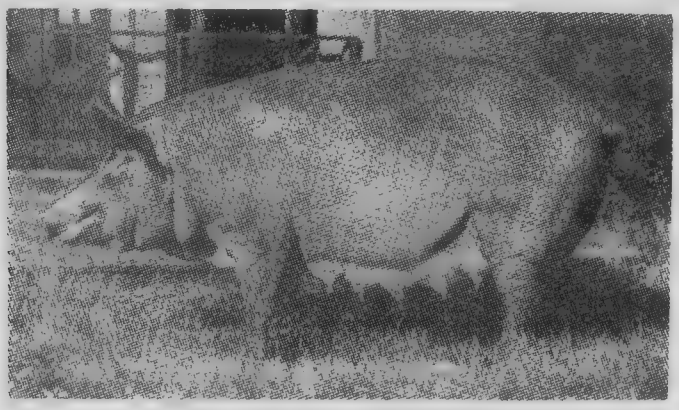

Fig. 2.—A Tamworth sow.

shire, although it is highly valued for crossing with the Yorkshire commercially. The red color of the Tamworth provides greater resistance to sunscald, an important consideration when pastures are used.

Berkshire

The Berkshire breed also originated in England. Canadian breeders have developed strains of Berkshire which can be classified as bacon-type pigs. As a breed the Berkshire is superior in loin, ham, and growth rate to either the Yorkshire or the Tamworth but a tendency to fatness and to some extent shortness may cause the carcass to be graded down under the Canadian grading system. The

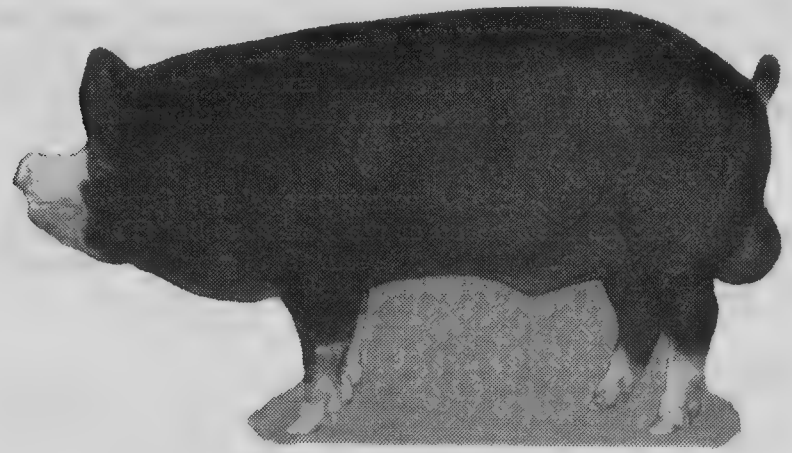

Fig. 3.—A Berkshire boar.

Berkshire is black which results in lower grades because of color pigment. Crosses with the white breeds produce white, thrifty pigs of desirable bacon type.

Landrace

The Landrace, a white breed native to certain of the Scandinavian countries, is going through a phase of speculative popularity at the present time. It has become popular, especially in Ontario, for crossing purposes. The Landrace has been developed in Denmark into an exceptional bacon pig. However, the Danes made the last exports of breeding stock about 1935, since which time most of the improvement in the Danish Landrace has been made. Landrace pigs available in Canada trace to importations from Sweden and from the United States. Those originating from the U.S. trace to importations from Denmark mostly prior to 1935 and have been under the influence of U.S. selection systems which do not emphasize carcass merit as we know it. Records of performance under Canadian conditions, as outlined on page 18, will obviously be of much value in selection of Landrace pigs for breeding purposes.

Lacombe

The Lacombe hog represents the first venture in the application of genetics and scientific breeding principles to the formation of a new breed of livestock in Canada. It is a flop-eared white pig, developed at the Experimental Station, Lacombe, Alberta, from a foundation of Landrace-Chester (a breed produced at Beltsville, Maryland), Berkshire, and Landrace stock. Its parentage at the present time is about ½ Landrace, ¼ Berkshire and ¼ Chester

White. It was developed with the objective that, in crosses with the Yorkshire, hybrid vigor would result. A mild inbreeding system and rigorous selection, based on complete records of performance, were used in developing the breed.

Other Breeds

Such breeds as the Duroc, Chester White, Hampshire and Poland China have been used occasionally in Canada with rather bad results as far as carcass quality and grades are concerned. These so-called lard breeds are fast-growing, which characteristic may influence their use in spite of carcass grades. It is possible to get growth and efficiency without resorting to the lard breeds. In the U.S. at the present time there is a big swing toward meat type within the above breeds. How successful these programs will be cannot yet be appraised.

New Breeds and Inbred Lines

Several new breeds have recently been formed in the United States. Because these breeds have been inbred they are commonly referred to as inbred lines. Those which have had sufficient emphasis placed on carcass quality may, at some time in the future, be found useful to Canadian producers. Such breeds as the Minnesota No. 1, No. 2 and No. 3, the Beltsville No. 1 and No. 2, the Maryland No. 1 and the Montana No. 1 are all superior to the old lard breeds in carcass quality while being equal or superior in growth and efficiency. These breeds cannot be recommended as yet since they have not been tested under Canadian conditions.

BREEDING AND SELECTION IN SWINE

Hereditary differences exist between individuals, families and breeds with regard to fertility, mothering ability, rate of gain, efficiency of feed utilization, carcass quality, disease resistance and other economically important characteristics of swine. Systems of breeding and selection methods have been devised through which permanent improvements in the efficiency of swine production are possible. Breeding, feeding, management and disease control all work together to make a hog production enterprise efficient. Proper understanding and application of breeding principles will ensure that a producer will be in a much better position to take advantage of advances in feeding, management and disease control covered in other parts of this bulletin.

Kind of Pig Desired

In order to proceed with the job of breeding a better pig, it is necessary to define the objectives or, in other words, list the import-

ant characteristics which would make a pig superior for the job we expect it to do. Emphasis should be placed on those economically important traits which are known to be hereditary. If selection can be based on a minimum number of the most important characteristics, more progress will be made than if a multitude of minor points are included. The most important economic factors in hog production are (1) fertility, (2) livability, (3) growth rate, (4) efficiency of feed utilization, and (5) carcass merit. Sows which consistently produce large litters of thrifty pigs which grow rapidly on a minimum of feed and give a maximum percentage of top carcasses are desired.

Once having defined the kind of pig which is wanted it is necessary to set up a testing and selection program which will help in picking this kind of pig.

Records

There is no substitute for adequate records as a basis for a sound breeding and selection program. Records will help to identify both pigs which should be multiplied because they are superior producers, and those which should be culled because they are inferior.

The Production Service of the Canada Department of Agriculture maintains a pig testing station at Edmonton in conjunction with their Advanced Registry policy. Litter groups of 4 pigs are kept on a standard ration from 50 to 200 lb. live weight, and pertinent records are obtained relative to growth rate, feed efficiency and carcass merit. Interested persons can obtain details from the Production Service, Canada Department of Agriculture, Edmonton. Advanced Registry information can be very useful to a breeder but it should be complementary to, rather than a substitute for, adequate records maintained on pigs kept at home from which breeding stock must ultimately be selected. The following section is designed to give an insight into records which should be acquired at home and used in one's own herd improvement program.

The purpose of record keeping in a swine breeding program is to accurately record the performance of each animal in a herd with regard to economically important traits. The information can then be used in an intelligent selection and culling program. The most important records to keep are (1) identification, (2) birth dates and perhaps birth weights, (3) weaning weights at 8 weeks, (4) age to market weight or approximately 200 lb., (5) type or conformation score at or near 200 lb., and (6) market grades.

Identification

If information relative to each pig is to be kept it is necessary to permanently identify each animal soon after it is born. Tattoos and ear tags are official systems for identifying registerable pigs and anyone wishing to identify for registration purposes should write to the Canadian National Live Stock Records, Department of Agriculture, Ottawa, for full particulars. Another method which may be adopted for private use is the ear notching system in connection with which a "V"-shaped notch is cut out of the edge of the ear with an ear notcher. A convenient marking system for up to several hundred pigs is shown in Fig. 4. Use of such a system will greatly improve selection, as litters and pigs are identified.

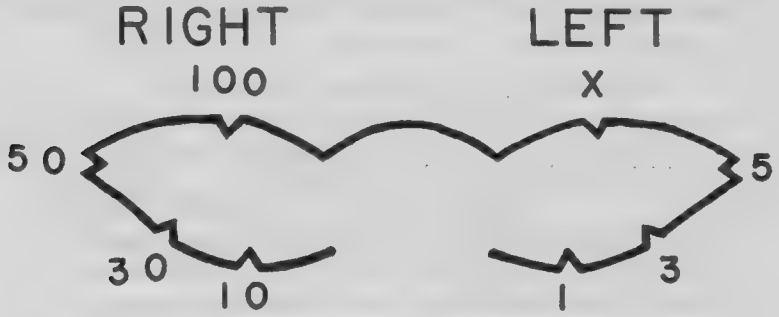

Fig. 4.—System of notching pig's ears for identification purposes.

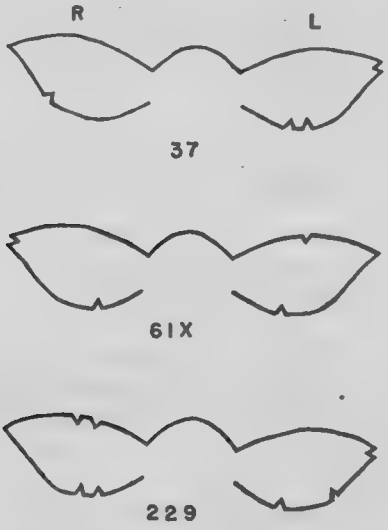

Fig. 5.—Example of the use of the ear notching system.

It will be noted that various combinations may be worked out. The right ear may be used to identify litters with all one litter being marked in the 20's, all the next in the 30's, etc. The left ear may be used to identify individuals within each litter. The first 10 pigs are notched 0 to 9, with the eleventh pig receiving an X, and the twelfth 1X, etc. Examples are shown in Fig. 5.

In additional explanation, it may be noted that two notches at the bottom of the left ear where the 1 is placed equal 2, or two similar notches on the right ear equal 20. A notch at 1 and 3 on the left ear equals 4 or a notch at 1, 3 and 5 equals 9. Similar notches on the right ear would equal 40 and 90 respectively.

Litter Records

A simple form to use for recording each litter's birth, weaning, growth, maturity and market information is shown in Fig. 6.

Dam 203 J Sire 74 J

Date of Birth of Dam July 8, 1954 Date of Birth of Litter Jan 20, 1956

Ear Notch	Sex	Birth Weight	8 weeks Weight	Date at Market Weight	Type Score	Age to Market Weight	Market Grade	Remarks
0	F	1.5	21	Aug. 8	8	201	A	
1	F	2.7	33	July 11	9	173	A	
2	F	2.3	29	July 18	8	180	A	
3	F	2.7						Died Jan. 23
4	F	2.4	35	July 11	8	173	A	
5	M	2.4	33	July 4	8	166	B,	
6	M	2	32	July 11	7	173	B,	
7	M	2.6	33	June 27	8	159	A	
8	M	2 7	32	June 27	7	159	B,	
9	M	2.5	33	June 27	8	159	B,	
0X	M	1.7						Died March 2
1X	M	2.7	33	July 4	8	166	B,	
2X								
etc.								

Fig. 6.—Litter Record Form.

At notching soon after birth, the ear notch, sex and birth weight are entered. At weaning each pig is weighed individually. Weaning weight should be taken at a standard age if comparisons are to be valid. If pigs are weaned at other than 8 weeks, weaning weights should be recorded at that time.

The date at which each pig reaches market weight at 200 lb. should be recorded. This is a convenient and appropriate time to

appraise an animal for type and conformation. Barrows are sorted out for marketing, and decisions are necessary at this particular time as to which gilts are to be saved and which are to be culled for slaughter. A type score has certain limitations, but is suggested as a useful record to keep where more accurate appraisal of carcass merit is not obtainable.

There are two main considerations in scoring for type and conformation: (1) appraisal of market acceptability, and (2) appraisal of general soundness and vigor. Considerations relative to (1) are length of body, fullness of ham, and indications of muscling with freedom from excess fat and flabbiness. In relation to (2), soundness of feet and legs, vigor and the presence of at least 12 functional teats are important attributes of prospective breeding animals.

It is suggested that a score of 1 to 9 may be allotted for type with 3 sub-groups as follows:

(1) definite culls with scores of 1 to 3—extremely short, chuffy types as well as those which are unsound or lack vigor;

(2) intermediates with scores of 4 to 6—retain breeding stock from this group only when insufficient replacements are available from group 3;

(3) potential breeding stock with scores of 7 to 9—long, meaty animals which are sound and vigorous, and possess 12 or more well developed teats.

The age to market weight is calculated from the birth date to the date at market weight. If the grade of pigs marketed is known it should be recorded.

Figure 6 shows a complete set of records from a typical litter raised at the University of Alberta in 1956. Specific use of records in a selection program is covered in the section beginning on page 22.

Sow Progeny Records

A second kind of record should be kept for each sow based on her own productivity and on that of her progeny. A useful form is illustrated in Figure 7.

Sow No.	Sire of Litter	Litter No.	Litter Birth Date	Age of Sow in Months	No. of Pigs Born Alive	No. of Pigs Weaned	Total Litter Weaning Weight	Av. Age to Market Weight	Av. Type Score	Market Grades
49G	111E	1	Feb 7, '53	12	10	10	304	201		2 kept, 8 unknown
	518E	2	Sept. 3, '53	19	14	12	270	245		2 kept, 10 unknown
	30H	3	Sept 14, '54	31	8	7	264	284		1 died, 6 unknown
	394J	4	May 5, '55	39	17	15	403	203	6.0	1A, 1B, 3 kept 8 unknown
	64J	5	Oct. 16, '55	44	11	10	437	165	8.3	3A, 7 kept
	74J	6	Mar. 28, '56	50	14	8	199	183	7.0	4A, 4B,

Fig. 7.—Sow Progeny Record Form.

The Sow Progeny Record Form is a summary of information recorded on the Litter Record Form. It makes possible quick comparisons between sows based on their productivity and that of their litters.

Other Useful Records

The major problem in producing high quality pork and bacon is one of reducing the proportion of fat and increasing the proportion of lean. At the University of Alberta tests have been conducted with a Lean-Meter,[1] a Purdue University device which measures the backfat thickness on the live animal. This instrument has proven to be quite accurate in estimating the fat in a carcass. Measurement of the backfat at or near market weight would be excellent supplementary information for use in selection of both gilts and boars.

Selection

Selection is the saving of certain animals for breeding stock and the culling of others. It implies differential reproduction whereby selected animals are encouraged to have many offspring while others are not allowed to reproduce. As has been mentioned, animals which are saved for breeding purposes should show superior performance in regard to economic characteristics. Comparison of the complete performance records of potential breeding stock should be the basis for selection and culling practices.

Selection can perhaps best be dealt with in three separate phases: (1) selection of gilts, (2) culling of sows, and (3) selection of boars.

Selection of Gilts

Final selection of gilts to go into the breeding herd should be made at or near market weight. It is important that gilts compared at this time have had similar treatment regarding feeding and management in order that any differences observed will truly be hereditary differences. It is also important that gilts be handled in a manner similar to market pigs because their performance will then be a better indication of what to expect from their offspring. No honest appraisal can be made of the breeding worth of gilts which have been given special feed, care and management. All gilts should be fed growing and finishing rations until they reach market weight (see pages 65 to 71) at which time they should be put on a gilt ration as outlined on page 54. The practice of removing one or a few gilts from an indoor fattening pen to outdoor competition with mature sows of various ages should be avoided.

[1]For information write to Duncan Electric Manufacturing Co., Lafayette, Indiana.

Gilts should be kept in separate outdoor quarters until they are properly hardened.

Use of records of performance as discussed above will facilitate selection of gilts that (1) are from sows which have consistently farrowed and weaned large litters, (2) have reached market weight in minimum time, and (3) have desirable market type. It would be desirable as well to choose gilts whose litter mates and other full sibs have achieved top market grades.

Culling of Sows

Gilts should farrow and wean large thrifty litters when they are at or near one year of age. Enough gilts should be bred so that a few can be culled on the basis of their first litter productivity. The number of pigs farrowed measures the prolificacy or fertility of the sow, while the number weaned and the total weaning weight of

Fig. 8.—A group of Yorkshire sows.

the pigs measure the mothering ability. Both measures are extremely important in the culling of sows.

Records at the University of Alberta indicate that mature sows will farrow as many as 3 more live pigs than will gilts. Generally, because of greater mortality due to overlaying, mature sows will wean only in the neighborhood of one pig more than gilts. These facts should be considered in the comparison of records made by mature sows and gilts. Other characteristics recorded on the Sow Progeny Record Form (Fig. 7) will aid in making a decision as to which sows to save.

Selection of Boars

The selection of a herd boar is extremely important. In a strictly commercial pig producing venture the boar will have to be purchased. High standards of performance should be demanded in a herd boar, and it is obvious that he should be purchased from a breeder who maintains adequate performance records. The herd boar should be from a dam which has consistently farrowed and weaned large litters. A top boar will have reached 200 lb. in about 5 months or less, have superior market type, and be strong on his feet and legs. A superior carcass record on tested litter mates, tested full sibs, or a superior carcass record on the test progeny of both the sire and the dam will aid greatly in selecting a herd boar. Efficiency of feed utilization, although not mentioned in the selection of gilts and sows, is extremely important and would be a valuable aid in appraising a prospective herd boar. His own feed conversion record from weaning to 200 lb. would be most desirable, but lacking this the feed conversion of tested litter mates, full sibs, or the test progeny of both sire and dam would be a reasonable second best. Fortunately rapid growth and efficient feed utilization are highly correlated, which means that selection of a rapid growing boar should improve the efficiency of feed utilization to some extent. If the practice of buying a boar at 5 to 6 months of age is followed, most accurate appraisal will be possible.

Breeding Systems

Breeding or mating systems refer to the amount of inbreeding, outbreeding and crossbreeding practised in a hog production enterprise. The principles of record keeping, culling and selection apply equally whichever breeding system is used. Discussion of breeding systems is presented from two points of view—that of the producer of seed stock, and that of the producer of commercial or market animals.

Breeding Systems for Seed Stock Production

The seed stock producer, with the aid of testing and selection practices based on records of performance (see page 18), should aim toward genetic purity or uniformity in order that commercial producers who buy breeding stock from him may obtain consistent results. Inbreeding is the system which produces genetic purity and prepotency. Inbreeding is the mating of related animals, and can vary in degree from close inbreeding, such as the mating of sire and daughter or the mating of brother and sister, to mild inbreeding where the only relationship between sire and dam rests on a common grand- or great-grandparent. Inbreeding has not been

popular among swine breeders. This is probably because inbreeding purifies with regard to both good and bad characteristics. It brings to light hidden recessive genes which may be undesirable. A seed stock producer should use some inbreeding in order to (1) establish relatively pure and genetically stable families and strains, (2) expose undesirable recessive genes in the population so the animals carrying them can be culled, (3) fix desirable gene combinations, allowing animals possessing them to be selected and multiplied.

Experimental evidence indicates that a rigorous testing and selection program is more likely to succeed if accompanied by mild inbreeding which permits the use of outstanding animals. By this means it is possible to improve the merit of the herd by selection and to increase the purity slowly and steadily. It is important that seed stock producers early recognize their responsibility to adopt a testing and selection program for economically important traits. They should breed more from within their own herd to achieve genetic purity and use an outcross only to correct a specific fault, returning immediately to the inbreeding system after the outcross is made.

Breeding Systems for Commercial Production

The best breeding systems for commercial production differ from those best adapted to seed stock production. It has been established that the mating of unrelated animals results in more vigor and thrift than the mating of related animals. A commercial producer should take advantage of this hybrid vigor in his breeding program. Outbreeding and crossbreeding are the systems which produce hybrid vigor. They tend also to cover up defects caused by recessive genes. The success of the commercial producer in a crossbreeding system will depend ultimately on how good a job the seed stock producer has done in breeding for purity and selecting for performance. The use of outstanding boars of the appropriate breeds is most important in a successful crossbreeding program.

Commercial breeding systems are grading up, outbreeding, and line crossing within a breed with crossbreeding, crisscrossing and rotational crossbreeding between breeds.

Grading Up

Grading up is the use of successive sires from an improved breed on nondescript females of unknown ancestry. Since only three or four generations are necessary before the graded population is essentially genetically equal to the improved breed used for grading, this system soon becomes one of either inbreeding or out-

breeding. Very marked improvement through grading up is achieved in the first and second generations after which disappointing results are often obtained. This is easily explained by a boost from hybrid vigor in the first two generations with later closer matings resulting in a decrease in hybrid vigor.

Outbreeding

Outbreeding, or the mating of unrelated animals within a breed, is the most common system used in Canada both commercially and in the production of seed stock. It is a covering up system and, if the animals used are sufficiently unrelated, fair results may be achieved. However, when a producer stays within a breed, the relationship between mated animals may be higher than expected and a drop in productivity may result. The biggest disadvantage of outbreeding is that results are extremely unpredictable.

Linecrossing

The crossing of inbred lines within a breed often gives very good results, providing the lines "nick." Unfortunately there are too few inbred lines in any swine breed in Canada to make this system available to the commercial producer.

Crossbreeding

Crossbreeding is the crossing of animals from different breeds. Many crossbreeding experiments have been conducted in both Canada and the United States with the majority indicating superior performance of crossbreds when compared to purebreds. Recent results from the University of Manitoba demonstrated an advantage

Fig. 9.—A group of Lacombe sows.

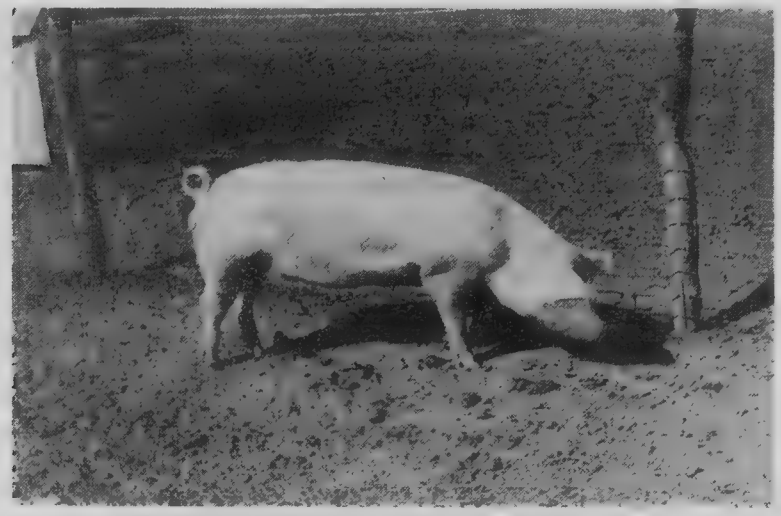

Fig. 10.—A Lacombe x Yorkshire crossbred gilt.

for Yorkshire x Tamworth crossbred pigs and backcross pigs (75% Yorkshire, 25% Tamworth) over purebred Yorkshires. Livability and growth rate were enhanced in the crosses and there was also a trend toward improved carcass quality. Crossbred sows were good mothers and surpassed both comparable purebred Yorkshire and Tamworth sows in productivity.

Crossbreeding experiments have recently been initiated at the University of Alberta. Preliminary comparisons of Lacombe x Yorkshire pigs with purebred Yorkshires indicate an advantage for the crossbreds in all characteristics measured. These included survival, weaning weight, rate of growth, feed efficiency and carcass quality.

Although crossbreeding has been employed for commercial swine production in Canada, there are two main reasons why it has not been as successful as might have been expected. Relatively indiscriminate crossing or mongrelization has been practised and the wrong breeds have often been used. Recent experimental information indicates that the greatest success from crossbreeding can be realized when a definite plan is established and adhered to. Choice of breeds which have superior performance of economic characteristics is very important. New tried and proven breeding plans as well as improved breeds and strains of bacon type should make crossbreeding more attractive in the future.

Crossbreeding Plans

Two breeds can be crossed commercially with all the off-

spring marketed. This system has the disadvantage that the commercial producer has to buy all his replacements, both male and female, and also does not take advantage of the superior productivity of the crossbred sow.

It is rather generally accepted that the crossing of two breeds has certain commercial advantages but that the use of the crossbreds themselves for breeding would be disastrous. This view is probably a result of observations made on herds where indiscriminate crossing has been practised for some time, giving a jumbled mixture bearing no resemblance to true crossbreds. There are certain biological reasons to expect an advantage in the use of a crossbred sow which demonstrates hybrid vigor compared to a purebred sow. The prenatal and postnatal environment provided by a sow to her unborn and nursing pigs involves a period of about 168 days during which the pigs are directly influenced by the mothering and milking ability of the dam. If crossbred pigs are more vigorous, crossbred sows being more vigorous should provide a better prenatal environment and be better mothers. Use of the crossbred sow has the practical advantage that a producer can raise his own female replacements.

Two systems involving the use of crossbred sows which have been tried and proven at various experimental stations are crisscrossing with two breeds and rotational crossing with three breeds.

Crisscrossing

Crisscrossing involves the alternate use of boars from two different breeds. Female replacements are selected from the herd. A five generation pedigree involving crisscrossing with Lacombe and Yorkshire boars is given in Fig. 11.

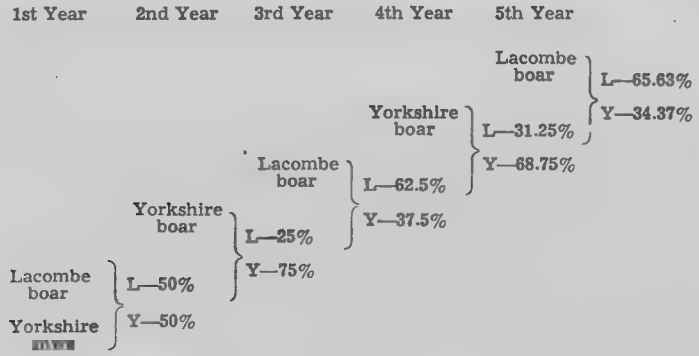

Fig. 11.—Pedigree showing 5 generations of crisscross swine breeding.

Rotational Crossbreeding

Rotational crossing usually involves only three breeds but can include more. Rotational crossbreeding with Yorkshire, Tamworth and Lacombe breeds is shown diagramatically in Fig. 12.

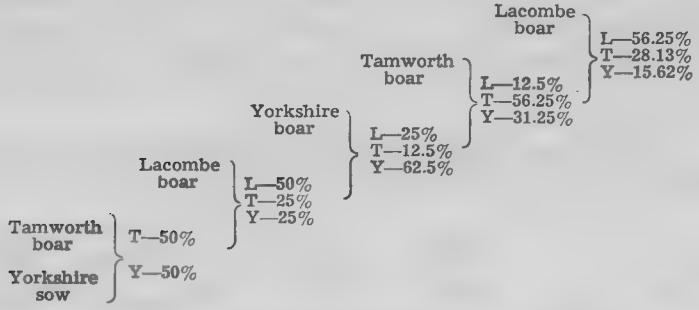

Fig. 12.—Pedigree showing 5 generations of rotational crossbreeding.

Once the breeds to use are decided upon, it is important to proceed systematically. The simplest procedure is to replace the sows with gilts each year. When the salvage value of sows is high this is a reasonable practice. For illustration, taking the crisscrossing example above; in the first year Yorkshire sows would be mated to Lacombe boars for spring farrowing and again for fall farrowing, after which they would be marketed. Lacombe x Yorkshire gilts saved from the spring farrowing would be bred to a Yorkshire boar for the next spring and fall litters and then marketed.

Some producers may be hesitant to try this system since it relies quite heavily on gilt performance, and many studies, including one completed in 1956 at the University of Alberta, indicate that the best performance is usually obtained from sows producing their third and fourth litters. It is possible, however, to maintain a systematic program taking any number of litters from each sow. Figure 13 shows an outline for a three-breed rotation where four litters are taken from each sow before she is marketed. Assuming an 8-sow unit of Yorkshire sows as a starting point, these would be bred to a Tamworth boar for spring and fall litters in 1957 and after weaning their fall litters the sows would be marketed. Ten crossbred Tamworth x Yorkshire gilts would be saved from the spring litters which should allow sufficient numbers to begin the next 8-sow breeding unit. Tamworth x Yorkshire gilts are bred to a Lacombe boar for spring farrowing in 1958 at which time about two of the poorest producing gilts would be culled and their place in the

herd taken by gilts of the same breeding saved from the 1957 fall litters. Most of the culling on sow productivity will take place on the basis of the first litter performance and it should be quite easy to take another three litters from those sows which are saved because of good first litter performance. As shown, in the spring of 1959 three-way-cross gilts are saved from the third litters of the Tamworth x Yorkshire sows, thus starting the third phase of the rotation. Intelligent selection of replacement gilts is possible because performance of their dams can be compared on the basis of two previous litters.

The system can be made flexible enough to allow any desired number of litters from each group of sows.

Year	Breed of Boar	Breed of Sow	Disposal of Sows After Weaning	Disposal of Offspring
1957—Spring	Tamworth	Yorkshire	Save	Save 10 gilts
Fall	"	"	Market all	Save 3 or 4 gilts
1958—Spring	Lacombe	Tam x York	Cull 2 or 3	Market all
Fall	"	"	Save	Market all
1959—Spring	"	"	Save	Save 10 gilts
Fall	"	"	Market all	Save 3 or 4 gilts
1960—Spring	Yorkshire	L x T x Y	Cull 2 or 3	Market all
Fall	"	"	Save	Market all
1961—Spring	"	"	Save	Save 10 gilts
Fall	"	"	Market all	Save 3 or 4 gilts

Fig. 13.—Outline of a 3-breed rotation system for an 8-sow unit.

Important Considerations in Setting Up a Crossing Program

The considerations involved in setting up a crossing program are choosing the breeds to use and the selection of boars within those breeds. Breeds should be chosen on the basis of their general performance for economic characters, their crossing or nicking ability, and their purity. Fertility, growth rate, feed efficiency and the ability to yield a high quality carcass are important performance measures to consider. Nicking or crossing ability depends on: (1) the performance of each breed on its own merits, (2) the lack of relationship in the ancestry of the two breeds, and (3) specific "nicking" or combining ability as determined by an experimental test.

The more genetic purity or inbreeding in the breeds used, the greater will be the uniformity in the crossbred offspring.

Since there are differences among individuals in any breed, especially those breeds which are not inbred, it is important to place a great deal of emphasis on the performance of the boar chosen for a crossing program (see page 24).

Color Inheritance

Since the Canadian grading system discriminates against black skin or hair roots it may be desirable in a crossing program to attempt to raise pigs which are white or red. With this in mind some of the color expectations from different breed crosses are listed below.

(1) Yorkshire x Berkshire—all white offspring unless the Yorkshire is impure for white in which case one-half will be black and one-half white.

(2) Yorkshire x Tamworth—mostly all white with some sandy and an occasional red and white. If the Yorkshire is impure for white one-half will be white and one-half will be red and black.

(3) Yorkshire x Lacombe
Yorkshire x Landrace } all white
Lacombe x Landrace

(4) The Landrace will behave in crosses similar to the Yorkshire.

(5) Tamworth x Berkshire—all red and black pigs.

(6) The Lacombe will have all white offspring in any cross except occasional sandy or reddish pigs when crossed with the Tamworth. No Lacombe pigs will be released until they are tested for purity regarding the white factor.

If white or red pigs used have black spots, more black spotting will show up in the offspring than is illustrated above. Black-spotted pigs should therefore not be chosen for breeding purposes.

Feeding and Management of Swine

In raising swine, considerable progress has been made when the correct breeding stock have been secured (see pages 22 to 24) but the ideal in bacon hog production will not be attained unless the best feeding and management methods are followed. The aim in the pig business should be the marketing each year of a maximum number of high quality pigs on a minimum amount of feed, or, in other words, economical production.

During the past 39 years more than 175 swine feeding experiments have been conducted at the University of Alberta. The main objects of these experiments have been to study rations, supplementary feeding, and methods of feeding with a view to determining the practices which will produce an acceptable type of pig at the lowest possible feed cost, and during a feeding period of minimum length. It will be the object of the discussion which follows to present to swine raisers a review of swine feeding and management problems based on the results of experiments conducted at the University of Alberta.

COMPOSITION OF COMMON SWINE FEEDS

Before commencing a discussion of feeding and management practices, however, it should be of interest to consider some facts relative to the chemical composition of common swine feeds and to draw some general comparisons between the various feeds available to Alberta swine producers.

Chemically the various components of feeds may be grouped under the following headings; water, protein, carbohydrates, fat, fiber and ash. The vitamins are another feed constituent that must be considered in the economic production of pigs. The constituents of oats, for example, are grouped in this way because each of these groups plays a definite and different part in connection with body maintenance and growth.

The water content is determined because the less moisture a feed contains the higher its feeding value, pound for pound. Cereals which are damp or tough do not return as good value for each 100 lb. fed as those of lower moisture content.

The protein contains all the nitrogenous compounds, and this part of the feed is used to produce lean meat, body tissue, hair, skin

and hoof. The demand for protein is very heavy in young growing pigs, pregnant sows and sows nursing litters. The bacon hog, which is a producer of lean meat, requires a plentiful supply of protein-rich feeds. Such feeds as skimmilk, meat scrap, fish meal, linseed oil meal and soybean oil meal are rich in protein.

The carbohydrates compose the starchy portion of the feed, and are largely used to supply the heat and energy required by the pig and for the production of fat in the body. All cereal grains are rich in carbohydrates.

The term fat, when used in connection with the composition of a feed, embraces not only true fat but certain fat-like substances. The fat is used largely for the same purposes as the carbohydrates, namely, heat and energy and the production of body fat. If a feed is very rich in oils, especially those of a soft nature, it may adversely influence the quality of fat in the carcass. None of the feeds commonly used in Alberta, with the possible exception of oats, is likely to cause any trouble in this respect.

The fiber is the part of the feedstuff which is of least use to the pig. Oat hulls consist largely of fiber and are to a large extent indigestible. Cattle and sheep can make considerable use of fibrous feeds because they have a large paunch, but the pig with its small stomach, can make little use of such feeds. This is a point to be borne in mind in pig feeding.

The ash contains the mineral constituents of the feed. The ordinary farm-grown grains are very low in ash. The hays and grasses contain more ash, with legumes, such as alfalfa and the clovers, being very rich in mineral matter, especially calcium. Since pigs are fed heavily on cereals, it is necessary to pay careful attention to mineral supplements, particularly calcium and iodized salt.

A table setting out the percentage composition of various feeds may constitute a valuable guide in arriving at relative values, and for that reason Table V is submitted. A large number of chemical analyses have been made of the common feeds and reliable average figures have been obtained. Feeds, particularly grains, may vary a great deal in composition, however, and for that reason swine producers are advised to make use of the **Agricultural Soil and Feed Testing Laboratory, University of Alberta, Edmonton.**

TABLE V.—PERCENTAGE COMPOSITION OF SOME COMMON SWINE FEEDS*

	Water	Protein	Carbo-hydrates	Fat	Fiber	Ash
	%	%	%	%	%	%
Barley	10.6	12.7	66.6	1.9	5.4	2.8
Oats	9.8	12.0	58.6	4.6	11.0	4.0
Oat groats	10.0	15.4	65.7	4.2	2.6	2.1
Wheat	10.6	13.5	69.2	1.8	2.8	2.1
Corn, Dent	15.0	8.6	69.3	3.9	2.0	1.2
Rye	10.5	12.6	70.9	1.7	2.4	1.9
Bran	9.9	16.9	52.9	4.6	9.6	6.1
Skimmilk	90.5	3.6	5.1	0.1	0.0	0.7
Meat scrap	6.2	46.1	4.7	12.7	2.1	28.2
Fish meal	7.1	63.9	4.0	6.8	0.6	17.6
Soybean oil meal	9.1	44.3	29.6	5.3	5.7	6.0
Linseed oil meal	9.0	35.0	36.4	5.7	8.3	5.6
Potatoes	78.8	2.2	17.4	0.1	0.4	1.1
Dehydrated alfalfa meal	6.4	18.9	38.1	2.8	24.3	9.5
Alfalfa hay	9.5	14.8	36.6	2.0	28.9	8.2
Mixed grass pasture	71.8	4.7	12.3	1.5	7.3	2.4
Oat pasture	86.0	3.2	5.4	0.6	2.8	2.0

*From Morrison's "Feeds and Feeding", twenty-first edition.

SWINE FEEDS AVAILABLE IN ALBERTA

A knowledge of the comparative values of the various feeds suitable for pig feeding should be of assistance in connection with planning a cropping scheme or in getting the greatest value for money spent when feed is purchased. The discussion which follows, when considered in conjunction with the figures dealing with chemical composition, should form a basis for evaluating the common swine feeds.

Grains and Grain Byproducts

Barley

Of recent years we have conducted a number of experiments with a view to determining the place of barley in the ration of young growing pigs. It has been our experience that the higher the percentage of barley in proportion to oats fed, the less feed is required to make growth, and the larger the returns for feeding under normal price relationships. In this connection an average result of three experiments is presented. In these experiments the various grain mixtures were fed in conjunction with skimmilk to pigs running on pasture.

TABLE VI.—RESULTS OF FEEDING VARIOUS MIXTURES OF OATS AND BARLEY

	LOT I Oats 2 Barley 1	LOT II Oats 1 Barley 1	LOT III Oats 1 Barley 2	LOT IV Oats 1 Barley 3	LOT V Barley Alone
No. of pigs	20	20	20	20	19
Av. initial weight lb.	36	36	36	36	36
Av. final weight lb.	205	203	203	203	205
Av. daily gain lb.	1.28	1.31	1.33	1.35	1.37
Feed req'd. for 100 lb. gain:					
Grain lb.	298	296	288	288	285
Skimmilk lb.	581	569	557	552	551

The results of these experiments justify the conclusion that for bacon hogs, when the cropping scheme favors the growing of barley, or when the relative price of barley versus oats is in favor of

barley, a higher proportion of barley than has been common may be safely and economically fed.

Oats

Oats may form a part of the ration for most classes of pigs. They may be used as part of the grain mixture for growing and finishing pigs, and as 50% of the ration for breeding stock, but we would not recommend that they be fed as a sole grain to any class of pigs. We are led to this conclusion as a result of our experimental work which indicates that grade A bacon hogs can be produced more efficiently and with less trouble from intestinal irritation or enteritis if oats are limited to not over 25% of the ration, particularly for pigs under 100 lb. in weight. The use of the heavier grains, such as barley and wheat, reduces the percentage of hull in the ration, and the young pigs are able to make better use of the feed consumed.

For finishing hogs, a high percentage of oats in the ration will normally improve carcass quality, although feed efficiency is reduced as pointed out in Table VII. The results reported in this Table are based on 2 experiments conducted in 1954-55 using a complete supplement with pigs fed in the barn.

TABLE VII.—COMPARISON OF OATS AND BARLEY FOR FINISHING HOGS

	Oats	Barley
No. of pigs	16	16
Av. initial weight lb.	109	113
Av. final weight lb.	193	192
Av. daily gain lb.	1.32	1.54
Feed required for 100 lb. gain lb.	459	421
Carcass grades:		
A	12	9
B-1	4	7
Average Advanced Registry Score %	73	68

Oat Groats

Oat groats or hull-less oats are a high energy, low fiber feed with a feeding value similar to wheat. They are extremely useful in creep feed or early prestarter rations if the price relationship to wheat is satisfactory.

Wheat

Wheat has not been commonly thought of as a pig feed unless in the form of the frozen or lower grades, but at times, owing to the establishment of quotas or a shortage of coarse grains in some areas, the place of wheat in swine rations comes prominently to the fore.

An experiment in which pigs were allowed to help themselves to ground wheat, oats or barley from separate self-feeders, indicated that they showed a decided preference for wheat. Because of its palatability and high energy content, wheat is very useful in creep feed rations.

On the basis of an experiment conducted at the University of Alberta during the winter of 1951-52, No. 5 and feed wheat were equal to or better than barley for growing and finishing swine except that they resulted in lower grading carcasses. In this experiment, 100 lb. of wheat was equal to 107 to 112 lb. of barley, and the No. 5 wheat was marketed through pigs at an increase of 30% over the elevator price.

Comparative Value of Barley, Oats and Wheat

Some idea of the comparative value of the three common farm grains for growing pigs may be gained from an experiment conducted during the summer of 1933 with growing and finishing pigs fed in drylot without pasture. Tankage was added to the ground grains at a rate of 8%, and the pigs had access to a simple mineral mixture.

It was noted that the pigs fed barley and wheat grew at about the same rate and more than one-tenth of a pound per day faster than those fed oats. Wheat proved the most efficient grain, followed by barley and then oats on the basis of pounds of feed required to produce 100 lb. live weight of pig. In this experiment the amount of gain produced by 100 lb. of ground oats was produced by 92 lb. of barley, 87 lb. of wheat and 79 lb. of grain when the three were mixed.

An experiment in 1956 indicated that somewhat higher protein levels are required to give best results with a wheat ration as compared to a barley or oat ration for growing pigs.

Rye

This grain is grown quite extensively in some parts of Alberta. Compared with grains already discussed it is an inferior pig feed, lacking in palatability and inefficient in promoting growth when fed alone. In connection with experiments conducted with finishing pigs, it was found that pigs took very unkindly to rye when it was fed as a sole grain, and it was only worth 70% as much as barley as a finishing grain. When mixed as not over 50% of the ration with other grain it can be used satisfactorily and economically. Rye containing as much as 0.1% ergot should not be fed to any class of pigs.

Corn

This cereal does not occupy a prominent position in pig feeding in Alberta. On account of its tendency toward a softening effect on the carcass, corn is not favored as a bacon feed, but when mixed with other grains and balanced with milk or other suitable supplements, it might constitute from one-quarter to one-third of the ration.

Damaged Grains

Although not studied at the University of Alberta, evidence from the Experimental Farm, Lethbridge, indicates that grains damaged by frost, molds, sprouting, rusts, smuts, or fire are normally satisfactory feeds for pigs. Moldy and burnt grains are less palatable than normal grains. Some caution should be used at the start in feeding damaged grains, particularly those that are moldy.

Screenings

Screenings of the quality of "No. 1 Feed" containing mainly small cracked grains, wild oats, buckwheat, and free from mustard and similar seeds, constitute a useful pig feed. In experiments conducted a number of years ago, pigs fed ground screenings of the above quality along with tankage made reasonable daily gains and required 394 to 454 lb. of feed to make 100 lb. of gain. The screenings were marketed through the pigs at a substantial profit.

Light, chaffy screenings are high in fiber, and consequently low in feeding value. Legume seed screenings were found to be unpalatable and of low value as pig feed in experiments conducted during 1948-49 at the University of Alberta.

Weed Seeds

While weed seeds are usually utilized in the form of screenings and are thus fed mixed with small or cracked wheat or other grains, there may be times when they are available in more or less pure form. Of the various weed seeds, wild oats can be utilized to best advantage, and in an experiment conducted during the winter of 1933-34 it was found that wild oats had as high a feeding value as good feed oats. Wild buckwheat has a fairly high feeding value and pigweed seed when mixed with grains can be made use of in pig feeding. In connection with an experiment conducted at the University of Alberta during the winter of 1937-38, when ground pigweed seed was fed along with ground oats and barley and a supplement added, it was found that pigweed seed had a feeding value of approximately 90% of that of oats. Seeds of the mustards and stinkweed are objectionable and pigs will usually refuse to eat mixtures which contain these seeds in any quantity. Such weed seeds may even cause an objectionable flavor in the meat of pigs. All weed seeds should be well ground before feeding so that they are no longer viable.

Shorts and Middlings

Shorts and middlings have always been regarded as very desirable pig feeds, particularly for young pigs which find them to be ex-

tremely palatable. These byproducts have the same deficiencies as our grains; therefore, we concluded after a series of experiments that they cannot normally be used with profit unless they can be purchased at a smaller cost per pound than grains are worth on the farm.

Bran

Bran may with advantage be used up to one-half the ration for brood sows prior to farrowing and immediately after farrowing. It is bulky and laxative, and as a result is valuable as a sow feed. Ordinarily price limits its place in economical pig feeding. Experiments conducted at the University of Alberta during 1949 and 1950 indicated that the dilution of a finishing ration with 20% bran tended to decrease the rate of gain by approximately 0:15 lb. per day, and to increase the feed required per 100 lb. gain by about 40 pounds.

Roots

While roots may not be regarded as a necessity in pig feeding in Alberta, when they are available they can be used to good advantage. They are of use for brood sows, providing bulk and succulence, but for growing pigs they tend to utilize too much valuable space in the digestive tract. Potatoes may be boiled and mixed with grain and in this way marketed through pigs in years of low potato prices. In this regard it was found that 411 lb. of cooked potatoes equalled 100 lb. of grain in feeding value.

Protein Supplements

In swine feeding the quality of protein is equally as important as the quantity. Proteins are built up of amino acids, 10 of which are essential for the pig, and it is the presence of the proper proportion of these amino acids that makes some protein supplements more valuable than others for pig feeding.

Skimmilk

Pig raisers who have skimmilk available are in a fortunate position. As a feed it is rich in protein required for the production of lean meat, in mineral matter required for the growth of a sound body framework and in vitamins required for correct functioning of the body. It is valuable in compensating for some of the deficiencies of farm-grown grains, and when supplementing the cereals makes for very economical production.

We are frequently asked as to the value of skimmilk, or what one could afford to pay for it if it could be purchased. Such a figure can best be arrived at by determining the amount of grain which it will replace in pig feeding. This was done in a series of

experiments when the influence of skimmilk as compared with other supplements on the quality of the carcass was being studied. Our conclusions were as follows:

Grain Prices per lb.	Value of Skimmilk per 100 lb.
½c	16c
1c	33c
1½c	49c
2c	66c
2½c	82c
3c	99c

The value of skimmilk depends upon the rate at which it is fed, and in this connection we recommend the following proportions of grain and skimmilk:

Weaning to 75 lb.	2.5 lb. to 1 lb. of grain
75 to 110 lb.	2 lb. to 1 lb. of grain
110 lb. to market weight	1 lb. to 1 lb. of grain

Dried skimmilk has similar properties to skimmilk, except that it is approximately 10 times as concentrated. Despite the high supplemental feeding value of dried skimmilk, it is generally too expensive to be an economical protein supplement for swine, except for very young pigs.

Buttermilk

What has been said regarding the place of skimmilk in pig feeding holds equally well for buttermilk as it comes from the churn. Buttermilk diluted with wash water or containing a high percentage of any added materials will have a lower feeding value.

Meat Scrap and Feeding Tankage

Meat scrap is a packing house byproduct consisting of thoroughly cooked and sterilized meat and bone scraps. Tankage is a similar product and the general discussion which follows may be applied to it as well as meat scrap. In a trial conducted in 1955 at the University, the use of either feeding tankage or meat scrap as supplements for growing pigs resulted in almost identical growth rates and efficiency of feed utilization.

A summary of 2 trials conducted in 1949 and 1950, and further verified in 1955, indicates a similar rate of gain and feed efficiency when pigs were fed a protein supplement containing 50% meat scrap in comparison to those fed a protein supplement of mixed vegetable origin. The economy of meat scrap versus soybean oil meal will depend largely on the prevailing price of these supplements.

There is some variability in the feeding value of meat scrap, and only a limited volume of the supplement is available. Therefore, meat scrap can be used to best advantage when incorporated in mixed supplements.

Fish Meal

In certain countries fish meal is used quite extensively as an addition to the grains in pig feeding as it is recognized as an extremely good quality protein supplement. For example, in an experiment conducted in 1955 with growing pigs from weaning up to 90 lb. in weight, a fish meal supplement added to a barley ration resulted in gains of 1.33 lb. per day and a feed efficiency of 295 lb. feed per 100 lb. gain which was superior to results obtained from several other supplements based on soybean oil meal, meat scrap or tankage.

Under usual price conditions the general use of fish meal as a supplement cannot be recommended. It may be added in limited quantities to improve a supplemental mixture, particularly for young pigs being creep fed, or immediately after weaning.

A generally acceptable recommendation is that 1/5 of the protein supplement added to a ration should be of animal origin.

Linseed Oil Meal

While linseed oil meal may be fed to advantage as a portion of a mixed protein supplement, it does not have a high value as a sole protein supplement for growing pigs as it is deficient in the same amino acids (protein building blocks) as are the cereal grains. In connection with experiments conducted a number of years ago, it gave the least satisfactory results of several supplements tested from both the standpoint of rate of gain and feed requirements.

Soybean Oil Meal

Of the plant protein supplements available in Alberta, soybean oil meal, when properly processed, has considerably the highest supplemental value for pig feeding. Although it is not recommended that it should be used to replace entirely supplements of animal origin, experiments at the University of Alberta indicate that it has almost as high a value.

Other Supplements of Vegetable Origin

Supplements such as rapeseed oil meal and sunflower oil meal are frequently available on the Alberta market. They may be satisfactorily used to form a portion of the protein supplement in a ration. Limited experimental evidence would indicate that their protein is more valuable than linseed oil meal but less valuable than soybean oil meal. Rapeseed oil meal should be limited to one-third of the total protein supplement (5% of the total ration) because of the possible presence of toxic principles, one of which disturbs the activity of the thyroid gland.

Alfalfa Meal and Alfalfa Hay

The value of good, green alfalfa appears to lie in its being fed in small proportions in a combination supplement or fed by the free-choice method on farms where it is produced. In addition to supplying protein and minerals, alfalfa is an excellent source of vitamins A and D and certain B-complex vitamins. Dehydrated alfalfa meal is usually superior to field-cured alfalfa meal or hay except that it supplies very little vitamin D. Dehydrated cereal grasses are similar in value to dehydrated alfalfa meal. As these products are all reasonably high in fiber they should be limited to 5 to 10% of the ration for growing pigs.

Alfalfa hay may be ground at home, thus providing a low cost alfalfa meal of good quality, providing that leafy green hay is used. Alfalfa hay is a very valuable feed for brood sows and may be fed at the rate of 10 to 30% of the grain ration, or fed free-choice in a rack.

Although not studied at the University of Alberta, there is experimental evidence that low levels (10%) of grass silage may be fed satisfactorily to growing hogs, with higher levels being useful in place of alfalfa hay for brood sows.

Mineral Supplements

In order that they may grow rapidly, pigs require an adequate supply of mineral matter, particularly salt and calcium. These minerals are lacking in our ordinary farm-grown grains and, unless the deficiency is made up by adding minerals to the feed, a lack of thrift is likely to develop and such acute conditions as stiffness and rickets may arise. Apart from the minerals mentioned, such minerals as iodine, which prevents the birth of "hairless pigs", and

Fig. 14.—Pigs which are not receiving sufficient mineral will become crippled. This group of pigs was fed during winter at the University on a ration lacking calcium.

iron, which prevents anemia in young pigs, may be lacking. Specific diseases arising from a deficiency of calcium are discussed in the following section, while iodine deficiency and anemia due to lack of iron are discussed on pages 56 and 61.

Calcium

That pigs respond to the feeding of ground limestone when there is a lack of this mineral in the feed is shown by the results of an experiment conducted during the winter of 1935-36. Two groups of pigs were fed in the piggery during the winter months on a grain mixture of equal parts of ground oats, barley, and wheat with the addition of salt and cod liver oil. One lot had ½ lb. of ground limestone added to each 100 lb. of grain.

TABLE VIII.—FEEDING GROUND LIMESTONE

	LOT I	LOT II
	Grain No Limestone	Grain, ½% Ground Limestone
No. pigs in lot	7	7
Av. number of days fed	161	155
Av. initial wt. lb.	46	45
Av. final wt. lb.	176	206
Av. daily gain lb.	0.81	1.04
Feed req'd. for 100 lb. gain:		
Grain lb.	514	467
Mineral lb.	.....	2.4

The pigs which did not receive the mineral grew more slowly and required more feed to make their gains than those fed the ground limestone, and in addition two pigs in Lot I became badly crippled during the experimental period.

Rickets and crippling in growing pigs are the most common manifestations of a lack of calcium in pig rations. In the winter or with pigs kept inside away from sunlight, lack of vitamin D may aggravate this condition. It should be remembered that while a deficiency of calcium or vitamins in weanling pigs may not be great enough to produce marked symptoms, it may be sufficient to lower resistance to other diseases, with results equally as disastrous. Lack of phosphorus may also cause lameness and rickets but phosphorus is seldom lacking in swine rations. In experiments conducted in 1953-54, addition of bone meal failed to improve the rate of gain or feed efficiency in pigs fed rations adequately balanced with salt and limestone.

Paralysis of the hind quarters occurs occasionally in brood sows, most frequently just prior to farrowing. The cause is often a lack of calcium and essential vitamins. The sow, when down, should be given a laxative diet with an ample supply of green feeds. Sows so affected may sometimes be brought back to their feet with the use of calcium preparations, but this requires the services of a Veterinarian. Prevention, however, is much more certain than cure,

and for this reason the pregnant sow must receive a good nutritious ration as discussed on page 54.

Iodized Salt

All pigs require salt in their rations, and, as much of Alberta is an iodine-deficient area, iodized salt should be used.

A simple mineral mixture which may be used with good results by keeping it before the breeding stock and growing pigs in a self-feeder may be made up as follows:

Ground limestone	50 lb.
Iodized salt	50 lb.

Unless a commercial protein-mineral supplement is being fed in adequate amounts, it is advisable to mix ½ lb. of ground limestone and ½ lb. of iodized salt with each 100 lb. of ration.

Zinc and Parakeratosis

Parakeratosis is a disease accompanied by severe dermatosis (scurfiness) of the skin, and unthriftiness. During the past 2 or 3 years it has occurred in various swine herds in Alberta, including the herd at the University Livestock Farm. It usually occurs shortly after weaning but may be present prior to weaning. It has been found that the addition of 50 to 100 p.p.m. of zinc to the ration of growing pigs will normally prevent or cure the condition, even though the basic problem is probably one of calcium metabolism. Zinc oxide, zinc sulfate or zinc carbonate at levels of 1/3 to 1/2 lb., 3/4 to 1 lb. and 1/2 lb. respectively per ton of complete ration have been used successfully to combat this condition.

Other Trace Minerals

Experiments conducted in 1953-54 at the University indicated no value from various trace minerals in swine rations. Manganese is added routinely to poultry rations (usually ½ lb. manganese sulfate monohydrate per ton of ration) and there is indication from work in the United States that it may sometimes be of value as a supplement to swine rations.

Vitamin Supplements

Vitamins A and D

Under Alberta conditions, vitamins A and D appear to be the only ones likely to be deficient in swine rations. In summer with pigs on pasture, vitamin A is supplied by the pasture in the form of carotene, and vitamin D is supplied by the sunlight. In a system of management where pigs are confined, supplemental vitamins A and D are required to prevent poor reproduction, crippled pigs and other ailments.

Vitamin D may be supplied by adding products such as irradiated dry yeast or dry vitamin D_2 to the ration, while synthetic dry vitamin A products are also available. These products are generally superior to fish oils because of their greater stability, although in an experiment conducted at the University in 1954, no difference in gains was noted between pigs receiving their A and D in feeding oil or in dry form. Commercial supplements contain the essential vitamins in sufficient quantities. If commercial supplements are not used, it is necessary to add the vitamin supplements to the ration, or to add feeding oil (fish oil) to the feed at the time of feeding. It is difficult for most producers to weigh the small quantities of dry A and D required, so it is preferable that they use feeding oil.

Rations for growing swine should contain 1 million I.U. of vitamin A and 200,000 I.U. of vitamin D per ton, with sow rations containing 2½ times this level of vitamin A. Based on these requirements, one may work out the amount of vitamin source to add to a ton of feed. One teaspoonful per pig per day during growth, and one tablespoonful per sow per day of a 1000A-150D feeding oil should be adequate. The vitamins in fish oils are quite unstable and are best not mixed in feed that is to be stored for more than a month. If mixed, 2 to 3 lb. of feeding oil per 1,000 lb. of ration should be used.

Other Vitamins

Trials at the University of Alberta in 1947-48 showed no benefit when riboflavin was added to typical growing rations for pigs, while an experiment in 1954-55 indicated no response from riboflavin added to a creep feed ration. Experiments from 1950 to 1952 demonstrated no positive response through growth, reproduction and lactation when supplemental calcium pantothenate was added to a typical Alberta ration. Little response has been obtained in studies over the past few years with vitamin B_{12} feed supplements. So far as is known there is little likelihood of a deficiency of any of the other B-complex vitamins. Despite this it is probably advisable that riboflavin, niacin, pantothenic acid and vitamin B_{12} be added to rations for young growing pigs to meet conditions of stress that may occur. Commercial supplements normally contain supplemental levels of these vitamins.

Antibiotic Feed Supplements

Since 1949 the University of Alberta has conducted numerous experiments on the use of antibiotic feed supplements in bacon hog rations. These supplements, containing antibiotics such as Aureomycin, Terramycin and penicillin, have given large increases in average

daily gain and feed efficiency under some conditions, but certain points should be observed in their use to get maximum benefits in production and economy.

Antibiotic feed supplements are extremely useful in creep feed rations and may prevent many runts at weaning. In a creep feed ration, reasonably high levels of 25 to 50 grams of antibiotic per ton of ration should be considered, as the creep feed provides only a fraction of the total feed intake.

If early weaning is practised, antibiotic supplements are necessary in the prestarter ration for success. Antibiotic feed supplements have given an excellent response when fed following weaning to unthrifty or runty pigs or those that are scouring.

Antibiotic supplements may be fed to 125 lb. live weight with only limited effect on the quality of carcasses from the pigs. Levels of around 10 grams of antibiotic per ton of feed would appear to be desirable. When fed throughout the finishing period to average quality hogs, the carcass quality has been consistently reduced in experiments at the University. Experimental results are given on page 67. This matter of carcass quality reduction is controversial and may vary with different strains of pigs but the risk of a major reduction in quality cannot be taken and it can only be hoped that

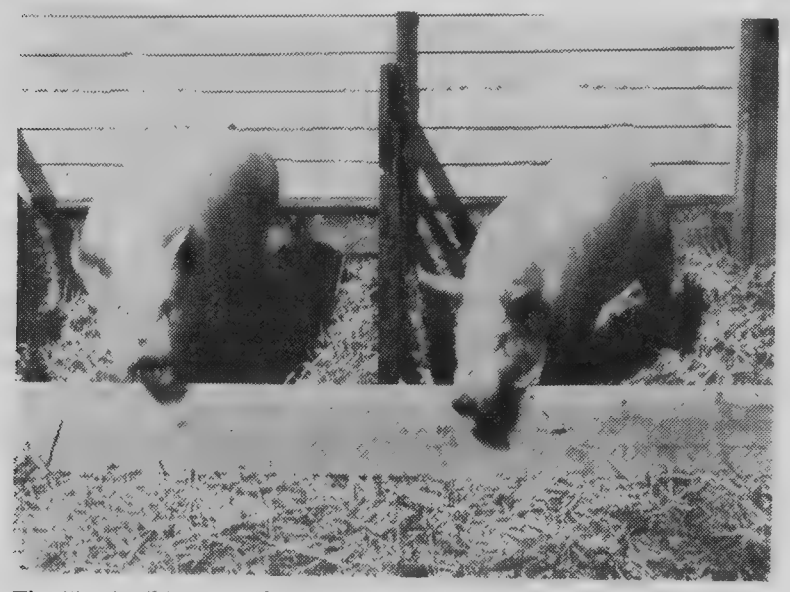

Fig. 15.—Antibiotic supplementation of swine rations. Pig on left received an antibiotic supplement throughout the finishing period while pig on right did not. Note evidence of excess backfat in pig on left.

our Alberta average for hog grades will be raised using every economically feasible means available.

Antibiotic feed supplements give best results when fed with rations balanced in all other respects, and when fed as recommended for a particular type of production.

Mixed Supplements or "Hog Concentrates"

Each of the individual protein, mineral, vitamin and antibiotic supplements already mentioned can be used to advantage in pig feeding. However, the best results from the standpoint of rapid gains and economical production are secured when several of them are blended together in such proportions as will provide a complete mixture. This process can be carried out on the farm by buying the various ingredients and mixing them according to a standard formula. Difficulty is often experienced in the weighing out of the individual materials and in getting a good "mix" unless a mechanical mixer is available. At the same time the labor involved is considerable, and cost of buying and storing in small lots is usually excessive.

The alternative is to purchase ready-mixed protein-mineral-vitamin supplements which are commonly referred to as "hog concentrates". The mixtures offered to swine raisers by reliable feed companies are made according to standard specifications which have been drawn up on the basis of experimental findings. They provide protein, minerals, vitamins and other additives in satisfactory proportions and the feeder may feel reasonably certain that, if these supplements are added to the grain in the proper amounts, and well mixed, good results will follow. The feed companies are also in a position to revise their formulas on the basis of the most recent information. This is important as new products and new research findings are constantly becoming available.

The mixing and sale of feeds by commercial concerns is regulated by the Canada Department of Agriculture through the Feeding Stuffs Act. The feeds must meet certain specifications provided for in the Act and on the outside of the bag will be found information relating to the percentage of important ingredients. The feeder should check this declaration so that he may be familiar with the quality of the feed which he is purchasing.

Combined protein and mineral supplements which have proven reliable may be made up as follows:

	Growing pigs	Sows
Meat scrap or other animal protein	25	25
Soybean oil meal, linseed oil meal, etc.	64.75	50
Alfalfa meal or ground hay	....	15
Ground limestone	5	5
Iodized salt	5	5
Zinc sulfate	0.25	....
Antibiotic supplement	*	....
Vitamin A and D supplements	**	**
	100 lb.	100 lb.

*To supply the equivalent of 4 gm. of antibiotic per 100 lb. of supplement.

**To supply the equivalent of 350,000 I.U. of vitamin A and 70,000 I.U. of vitamin D per 100 lb. supplement.

The mixture may be modified in a number of ways, although a similar type of supplement should be used to make the substitutions. It is evident from studying the above supplement that few producers are justified in trying to mix their own "hog concentrates" but should purchase commercial concentrates unless they have adequate skimmilk available.

Pasture Crops

Pasture crops can be utilized extensively in Alberta in connection with pig raising as pasture is a decided asset in the feeding and management of breeding stock. In addition, under the average conditions prevailing, good pasture crops will do at least two things: (1) Provide more sanitary conditions than usually prevail in the pens and yards and thus to a considerable extent avoid the possibility of disease infection and worm infestation. To perform this function a proper system of pasture rotation should be followed to prevent

Fig. 16.—General view of experimental groups of pigs on pasture at the University of Alberta.

the concentration of disease and parasites. (2) Allow the pigs the opportunity of securing some of the protein, minerals and vitamins which may be lacking especially when skimmilk is not available.

Experiments conducted at the University of Alberta in recent years indicate that when supplemental feed is not available, one may expect more rapid gains and a decrease in the cost of making gains when pasture crops are used as compared with feeding in the drylot. When proper supplements are fed pasture crops do not make such a good showing with growing pigs, but are often still valuable. For breeding stock pasture is almost a necessity for optimum success.

For the benefit of those who hesitate to use a pasture crop for their pigs on account of the tendency of pasture to cause "blistering" or "sunscalding", we would say that when suitable shelter is provided close to the feed trough or self-feeder, blistering will be reduced to a minimum. When pigs do become so afflicted, a liberal application of mineral oil to the affected parts will generally alleviate the condition. It should be noted, however, that on the basis of observations at the University of Alberta, white pigs turned out to pasture in sunny weather may make extremely poor gains for 2 to 3 weeks.

Crops which have been tested experimentally as hog pastures are: rape, alfalfa, sweet clover, sunflowers, mixtures of oats and fall rye, and cereal mixtures consisting of various combinations of oats, barley and wheat. Where alfalfa can be grown, it is undoubtedly the peer among swine pastures, making an early start in the spring and providing a bulk of forage throughout the season. A mixture of alfalfa and grasses such as brome, will give a longer pasture season, and will often have a longer life. Rape has stood next to alfalfa in our experiments. While it does not provide pasture as early as alfalfa, it has a wonderful carrying capacity under Edmonton conditions and maintains a growth until late in the season. Rape is not a good pasture for young pigs as it causes irritation to their skin.

It might be stated, however, that good results have been secured from many different crops tried experimentally. Annual pastures allow a better system of rotation than permanent pastures, but both have a place. The crops selected will depend upon local conditions, and on this point we conclude that the choice of a crop is really secondary to making provision for green forage in some form.

In connection with the use of pasture crops for pigs being fed for market, it should be kept in mind that pasture is used as a supplement to grain feeding rather than a sole means of main-

tenance as in the case of cattle or sheep. Best results are secured when pasture is used in conjunction with liberal grain feeding. Less protein supplement is required on pasture than in drylot but such supplements should not be reduced by more than 50 per cent.

Fig. 17.—Brood sows should have access to good pasture during the summer months. The above illustration shows a few of the sows at the University Farm on their summer pasture.

Brood sows can make particularly good use of pasture and every effort should be made to supply them with fresh forage from early summer until fall.

Pasture lots for market pigs should not exceed from one-half acre to one acre in size, and where a larger area is required, cross fencing is strongly recommended. Carrying capacity of pastures varies tremendously with the region, season and type of pasture. However, a general recommendation is that an acre of pasture is sufficient for fifteen to twenty finishing hogs or 3 to 5 sows with litters.

Feeds for Inside Pig Production

When permanent, sanitary hog houses are available, and when supplements are provided in adequate amounts, a system of intensive inside pig feeding can be followed. Pigs may be pen fed satisfactorily from the time they are weaned until ready for market. This system may involve more labor but the investment in pasture land and fencing is eliminated and the difficulty of sunscalding with white pigs is overcome.

Experiments conducted at the University of Alberta indicate that pigs full-fed a well balanced ration and pen fed from weaning time until ready for market, make rapid and economical gains.

Inside pig production makes it necessary to study carefully the proper addition of supplements to the farm-grown grains. If the

protein, mineral and vitamin requirements of pigs are not taken care of under such a system, disappointing results are sure to follow.

A Balanced Ration

In the discussion regarding the feeding of different classes of swine which follows it is assumed that the majority of swine feeders will be using a mixed supplement or "hog concentrate" containing 35 to 40% of protein and recommendations will be based upon this assumption. The term "supplement" will be used in this connection. Generally speaking, 15% supplement should be added to the grain for young pigs and 8% for pigs over 110 lb. in weight. See page 46 for more details.

A balanced ration is one that supplies all of the nutrients required by an animal at the optimum levels to bring about the best and most economical production. While the addition of one or other of protein or mineral to a mixture of farm grains will bring about improvement in the performance of growing pigs, it requires both to balance the ration properly and insure best results. This is indicated by the results of a series of experiments conducted at the University of Alberta. One group of pigs was fed on grain alone, one had ground limestone added to grain, and a third had both protein and mineral added. The pigs were fed inside the piggery; 1% of salt and 1% of cod liver oil were added to the feed mixture in all lots. The results are shown in the following table.

TABLE IX.—PROTEIN AND MINERAL ADDED TO GRAIN

	LOT I Grain Alone	LOT II Grain, Mineral	LOT III Grain, Mineral, Protein
Average initial wt. ....lb.	51	50	50
Average final wt. ....lb.	139	167	201
Average daily gain ....lb.	0.69	0.92	1.27
Feed eaten per day ....lb.	3.64	4.35	4.75
Feed req'd. for 100 lb. gain ....lb.	525	472	373

It will be noted that the addition of mineral alone contributed to improvement, but more feed was eaten per day, the average daily gain was increased and the feed requirement for 100 lb. gain was lowered when both protein and mineral were fed. Improvements in ration formulation, particularly the use of antibiotic feed supplements, have further improved this picture.

Preparation of Feeds

Cooking

Experimental work and private experience have shown that cooking decreases the digestibility of most feeds, and adds to the cost of production. Many feel that winter pigs do better when the feed is cooked, but on the basis of three experiments, when cooked grain was compared with dry grain fed from a self-feeder, we con-

clude that the expense of cooking the grain is not warranted. Such feeds as potatoes are better cooked, and garbage must be cooked to eliminate the hazard of disease. When economy is not an object, such as in fitting for show, the palatability of feeds may be improved by cooking.

Soaking

Soaking grain does not seem to be good practice, as even when whole grain is soaked conditions are not improved. This occurrence is indicated in an experiment conducted during the winter of 1931-32 at the University of Alberta. Pigs fed whole dry grain (oats and barley) gained 29% faster and required 10% less grain for 100 lb. of gain, than those fed the same mixture after soaking.

Grinding

We are asked from time to time whether or not it pays to grind grain for pigs. This question is of special interest in time of low prices of grain and hogs, as there must be sufficient grain saved in producing a hog by using ground grain to pay for the cost of grinding. Related to this question is one concerning the degree of fineness to which grain should be ground for pigs. Efficiency of feed utilization was reduced an average of 9% by feeding whole barley as compared to ground barley in three experiments at the University of Alberta during 1955-56. Based on these and earlier experiments, it would appear that moderately fine grinding is to be recommended with barley and oats if such a treatment can be given at moderate cost. Wheat should not be too finely ground for pigs; a rather sharp gritty texture is best.

Pelleting

Studies during 1954 to 1956 with pelleted creep feed rations and with pelleted supplements fed free-choice have shown no effect on palatability, rate of gain or feed efficiency due to pelleting as compared to normal grinding of these feeds. Pelleting will reduce dustiness and with some feeds may be desirable if it can be done at a reasonable cost.

Methods of Feeding

There are two methods of pig feeding commonly practised: (1) the hand-feeding method, feeding the ration either wet or dry twice or three times daily, and (2) the self-feeding method, where the self-feeder is used and feed is kept before the pigs at all times.

The method to be recommended will depend upon the number of pigs to be fed, the amount of grain on hand, the rate of gain desired, and the amount of labor available. The relative merits of the two

Fig. 18.—Pigs at self-feeders. Note the one-way self-feeder together with a two-way self-feeder.

systems have been extensively studied experimentally. The problem was carefully considered in a series of experiments conducted at the University of Alberta during 1946 and 1949-50. Hand-feeding was compared with self-feeding with respect to rate of growth and feed requirements and with regard to influence on the type of pig and quality of carcass produced. In view of the importance of this question the conclusions drawn from these experiments are as follows:

Self-feeding does not cause any large or consistent difference in rate of gain, feed required per 100 lb. gain, or cost per 100 lb. gain when compared to full hand-feeding. Under practical conditions pigs are often not full-fed when they are hand-fed and under such conditions self-feeding would undoubtedly increase the rate of gain.

The number of grade A carcasses yielded was similar in both the hand-fed and self-fed groups. More detailed scoring by Advanced Registry methods showed that the carcasses from the hand-fed lot were somewhat superior to those from the self-fed group in the 1946 trials, but this was not so in the 1949-50 trial. Further study suggests that, if the breeding stock in use is just borderline for length and backfat thickness, self-feeding may result in a reduction in the percentage of grade A carcasses.

The experiments indicate that a good deal of labor and often drudgery can be saved by the use of a properly constructed self-

feeder, and that, if the breeding stock is of the right type, self-feeding can be practised without serious reduction in carcass quality.

A third method of feeding is widely followed in the midwestern United States and has been studied extensively during 1955-56 at the University of Alberta. This is free-choice feeding of grain and a complete supplement in separate feeders to avoid the cost of mixing. It appears that free-choice feeding of barley or barley and oats with supplement may result in slower gains than are obtained from a mixed ration, but that feed efficiency will be similar under either method of feeding. A palatable supplement containing about 40% total protein is desirable for best results in free-choice feeding.

FEEDING AND MANAGEMENT OF BREEDING STOCK

Breeding stock can be selected most satisfactorily when pigs are around 200 lb. in weight as at that time it is possible to observe the animals in market condition. Adequate records (see page 18) must be kept so that individual litters are identified, as intelligent selection must be based on performance (see page 22).

Sows

Having secured the right brood sow much of the year's success in pig raising depends on how she is fed and handled prior to breeding and during the pregnancy period. Sows which are bred in good condition and are well nourished during the pregnancy period are much more likely to farrow big strong litters than sows which are thin and run-down when bred and poorly cared for during pregnancy.

The raising of two litters per year by at least a fair percentage of the sows, would tend to equalize the marketings and in addition would lower the cost of production. The cost of carrying a sow for the year is very little greater when she farrows twice than when she farrows only once.

It must be borne in mind, of course, that when sows farrow during the late fall or winter months, better than average farrowing quarters must be available. Provision will have to be made for artificial heating (see page 58), care must be taken to avoid chilling of the young pigs at time of birth and during the suckling period, and strict precautions will have to be taken to guard against the development of anemia in the young pigs (see page 61).

Pigs farrowed during the late fall or early winter months may cost more to produce but on the basis of the usual price prevailing on an open market they will bring a higher price than those farrowed in the spring and marketed during the fall months. In the

University of Alberta herd for the 15 years from 1935 to 1949 it took an average of only 3 days more per pig to market fall pigs compared to spring pigs. Eight pigs per litter were weaned from the fall litters compared to only 7.6 pigs per litter from the spring litters.

Feeds for Breeding Stock

Following selection at market weight of gilts and boars for breeding stock, they should be transferred from a finishing ration to a gilt ration as outlined in the following section (for boars see page 57).

Grains

Farm-grown grains, such as barley, oats and wheat, may form the basis for suitable rations for breeding stock. Mixtures containing about 50% oats have been used satisfactorily at the University of Alberta. Oats are the safest single grain for brood sows, but there is an advantage in adding some wheat or barley to the oats. Barley and wheat alone are too fattening for sows or boars, and may tend to cause weak pigs and a lack of milk in sows at farrowing time.

Grains may be fed ground and either slopped or dry. Self-feeding may be practised but a bulky ration should be used. If sows become too fat on self-feeding, they should be changed to hand-feeding and their feed intake limited.

In order to convey some idea as to the amount of adequately supplemented grain required to bring pregnant gilts and sows through the winter in good condition, the following daily allowances are suggested:

Mature sows: 1 lb. per 100 lb. live weight during the first 12 weeks—1.3 lb. during the last 4 to 6 weeks, to gain 75 to 100 lb. during pregnancy.

Yearling sows: 1.6 lb. per 100 lb. live weight, to gain 100 to 125 lb. during pregnancy.

Gilts: 2.0 lb. per 100 lb. live weight, to gain 100 to 125 lb. during pregnancy.

With good pasture, water and shade, the amount of grain fed should be limited, especially with mature sows, unless they are quite thin when their litter is weaned. Young growing gilts should receive practically as much grain and supplement during the pasture season as at any other time if they are to be given a chance to develop properly.

Supplements

Feed 12% sow concentrate to sows and 15% concentrate to gilts if no good pasture or alfalfa hay is available. Otherwise, with

Fig. 19.—Gilts on good summer pasture. To develop properly they must also receive adequate grain and supplement.

mature sows it is not necessary to feed over 5 to 6% of supplementary feed apart from good, well cured alfalfa hay. Alfalfa may be mixed with the grain at the rate of from 10 to 30%, and if the alfalfa cannot be ground and fed in this way it may be placed in feed racks or fed on the ground. If alfalfa is not available some other legume hay may be substituted or even green oat sheaves will be helpful. With young sows which will farrow their first litter, such foods as skim-milk or buttermilk are useful and may be used to reduce other supplements required. Our young sows at the University are fed approximately 10% of supplement in addition to alfalfa meal or alfalfa hay. If root crops are available they can be fed to advantage to the sow. One pound of bran added to the feed daily for two or

Fig. 20.—Yorkshire sow with litter of 12 pigs at the University of Alberta. The pregnant and nursing sow should be liberally fed to stimulate milk production.

three weeks before and for several days after farrowing will exercise a laxative influence.

If skimmilk or other protein supplement is being used instead of a complete "concentrate", the feeding of iodized salt, limestone (see page 43) and a vitamin A and D supplement to pregnant sows is strongly recommended.

Hairless Pigs—Goiter

The thyroid gland of any animal is necessary to maintain life and its function is dependent upon a supply of iodine. The amount of iodine required is very small, but in many localities in Alberta there is a lack of iodine in the soil, so iodine must be supplied, or iodine deficiency and goiter will result. Little pigs, as a result of iodine deficiency, are born without hair, have a puffy skin and usually are thick around the neck. They are often dead at birth, or die within a day or two.

The disease is easily prevented by supplying iodine in sufficient amounts to the pregnant sow, usually in the form of iodized salt. If iodized salt does not prove adequate, dissolve one ounce of potassium iodide in a gallon of water and give one tablespoon of this solution daily in the feed. The solution must be kept in a glass or enamelware container.

Fig. 21.—A colony house banked with straw provides good shelter for wintering pregnant sows. For sows 12′ × 8′ or 12′ × 10′ houses are preferable to smaller colony houses as illustrated in Fig. 30.

Vitamin A Deficiency

Frequently in the winter and early spring, weak litters, sometimes partially blind or suffering from convulsions, may be born. These conditions are often due to a vitamin A deficiency. Therefore, for sows not on pasture, care must be taken to supply adequate vitamin A (see page 44) unless the recommended level of commercial concentrate is being fed.

Exercise

Sows should be required to take a reasonable amount of exercise. Therefore it is a good plan to arrange to have the sows' shelter at some distance from the place where they are fed so that they may be forced to walk a considerable distance for feed. With regard to shelter, the main requirements are a dry bed and freedom from draughts and overcrowding. At the University of Alberta brood sows are always wintered in colony houses of such type as illustrated on page 56.

Balanced Rations for Sows

The importance of balanced rations for brood sows is indicated by the results of an experiment which was conducted at the University of Alberta prior to 1949. Sows denied access to pasture and fed continuously on a mixture of 98 lb. equal parts oats and barley plus a pound of ground limestone and a pound of iodized salt weaned an average of only 4.6 pigs per litter as compared to an average of 8.2 for sows fed the same grain supplemented with minerals, feeding oil, protein and pasture in season. Due to the added expense involved in providing pasture as well as protein, mineral and vitamin supplements for the sows of the latter group, the cost of maintaining these sows was somewhat more than one and a half times the cost of maintaining the group that weaned only 4.6 pigs per litter. However, the net return from the well-fed sows over a 3½ year period was four times that realized from an equal number of sows fed the unbalanced ration.

Boars

The boar on many farms is apt to be a neglected animal. Actually the ideal treatment of the boar is practically identical with that of sows of a similar age, and suggestions made for feeding the sow should also be applied to the boar. During the breeding season the boar's allowance should be increased and as palatable feeds as possible fed, as many boars are apt to go off feed at that time.

A few special comments on management of the boar are in order. He should be provided with plenty of exercise to keep him in good breeding condition. He should have the company of sows in an ad-

joining pen to help in keeping him from becoming bad tempered. Young boars should not be used for breeding until they are from 8 to 9 months of age, and not used too extensively during the first season. It is a mistake to allow a young boar to run with the sows and breed indiscriminately. Mature boars should have their tusks removed to increase safety in their handling.

Care at Farrowing Time

Farrowing time is the critical time in the pig business. Heavy losses are apt to occur here unless care is exercised. It is estimated that 20 to 30% of the pigs farrowed are lost between farrowing and weaning time. A pig which dies at farrowing may not appear to represent a heavy loss, but it means one pig less at marketing time.

The following farrowing time precautions are suggested:

(1) Provide warm farrowing accommodation for sows farrowing during the winter and early spring months. Artificial heat for the young pigs may be provided in the form of a "brooder house", a heated piggery (see page 77) or a heat lamp with a 250-watt infra-red bulb placed in a partitioned-off corner of the farrowing pen.

Fig. 22.—Infra-red heat lamp for pig brooding showing installation to comply with the Rural Wiring Regulations of the Province of Alberta.

(2) Remove the sow from her winter shelter or summer pasture to a suitable farrowing pen at least one week before she is due to farrow. The length of the pregnancy period in the sow is from 112 to 115 days, or 3 months, 3 weeks, 3 days (see gestation table for brood sows on back page of bulletin).

(3) Properly clean and disinfect the farrowing pen before the sow is placed in it. It is recommended that the floors be scrubbed with a strong solution of lye in **boiling** water (1 lb. of lye to 30 gallons

of water). This destroys worm eggs and prevents the little pigs becoming infested with round worms while in the farrowing pen.

(4) Provide a guard rail around the side of the farrowing pen. This rail, which may be a 2″ × 4″, or a pipe, should be placed approximately 8 inches from the floor and project out 8 inches from the wall. This guard rail allows the small pigs to seek protection when the sow lies down, and is a worthwhile means of avoiding loss by crushing.

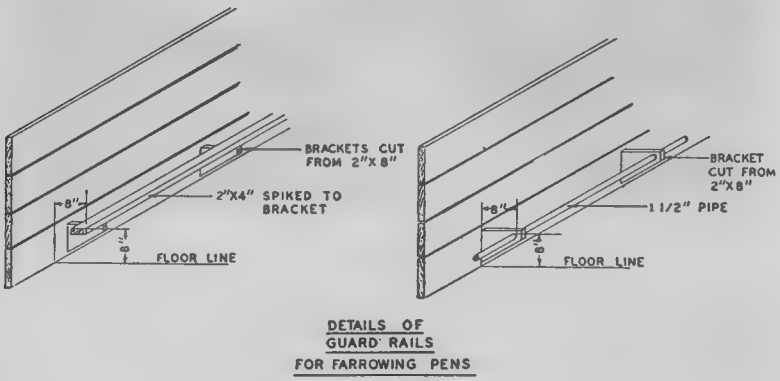

Fig. 23.—Details of farrowing pen guard rails to prevent the sow from crushing the young pigs.

(5) Avoid long coarse straw in the farrowing pen. The newly-born pigs may become either tangled or buried in the long straw, and thus are more likely to be crushed. Cut straw or shavings in limited quantities makes the most suitable bedding for the farrowing pen.

(6) The sow should be watched carefully at farrowing time so that help can be given in case of weak pigs or an irritable sow. If the small pigs have become chilled they may be revived by placing them in a box near the stove, or individual pigs may be wrapped in a warm blanket or immersed up to the neck in warm water. When the sow is irritable or clumsy, it is a good plan to remove each pig as it is born and return the complete litter for nursing when farrowing has been completed and the sow is resting quietly.

(7) Remove the small tusks, or "black teeth" as they are commonly called, from the mouths of the small pigs within a few hours after they are born. These sharp teeth irritate the sow's udder and cause cuts and scratches on the faces of the pigs while fighting at nursing time. The job can be done with sharp small nippers made for the purpose. Care should be taken to avoid cutting the gum, and to avoid jagged edges on the cut tooth. (See figure 24.)

Fig. 24.—Removal of the small tusks or "black teeth" shortly after a pig is born.

(8) Failure of the sow to milk is frequently brought about by faulty management and inadequate feeding during pregnancy. Feed well balanced rations containing plentiful protein, minerals and vitamins as discussed earlier. Do not wait until the last few weeks of pregnancy to feed such a ration, but feed it throughout the entire pregnancy period. A light, laxative feed will sometimes bring about milk flow in a sow which fails to start milking. A run-down condition due to overwork from previous litters may cause a sow to dry up, and in this case very little can be done to re-initiate milk flow. She must have reserve flesh to draw upon during lactation. Even with adequate rations and good management an occasional sow may not milk, and in such a case milk flow can sometimes be initiated by the use of hormones and calcium preparations administered by a Veterinarian.

Feed and Care of Sow and Litter

Sows should not be fed heavily following farrowing but should be allowed lukewarm water. If they are not sick they should be allowed feed as soon as they wish to eat, which is usually inside of 12 hours. The first feeds given should contain a high percentage of such feeds as bran, shorts and oats. The feed may be gradually increased and heavier feeds added until the sow is on full feed in about a week. Sows at the University normally eat 14 to 18 lb. of feed per day during the major part of lactation.

A most satisfactory ration at this time is one that includes either skimmilk or buttermilk. When skimmilk or buttermilk is not available, the addition of 12 lb. of protein-mineral-vitamin supple-

ment (sow concentrate) to each 100 lb. of grain is to be recommended. In the case of gilts, 15% supplement is advisable. A mixture of 50% oats with barley and/or wheat may be used satisfactorily as the grain mixture.

Care of the Litter Before Weaning

Prevention of Anemia

When pigs are born during the winter and early spring months and are confined to the piggery, special care must be taken to prevent the development of anemia. Anemia of suckling pigs occurs as a result of a deficiency of iron and to some extent, copper. Iron constitutes an important part of the blood, and without it the blood is unable to carry out its proper function of supplying the body with food and oxygen. Anemia of little pigs is the cause of substantial losses annually.

The anemia is usually apparent within a week after birth. In white breeds the skin is noticeably pale, the hair is dull and lacks luster and sheen. The ears which are normally pink become white. The little pigs may show listlessness and lack of playful energy observed in healthy litters. In severe cases there is evidence of rapid or labored breathing, a condition sometimes termed "thumps", possibly followed by death.

The iron necessary for life is present in the soil, and animals that are on pasture usually receive sufficient amounts. Sow's milk contains little iron, and from birth until they begin to eat regularly, pigs raised inside have a deficient supply of available iron.

Anemia is preventable by supplying available iron to little pigs for the period from birth until they begin to eat. There are several methods by which this may be accomplished:

Iron may be supplied to the pigs individually in the form of "reduced iron". The dose is estimated at being an amount which would cover half a ten-cent piece. Studies at the University of Alberta in 1948 and again in 1954 indicated that pigs should be given the first dose when they are three days old, and the dose repeated at twice weekly intervals for three weeks or until they are eating regularly. Adding a little fish oil with the iron by means of an oil-can prevents the possibility of the dry reduced iron going down into the lungs.

Commercial preparations are available in which iron is incorporated with copper. These preparations are used in a similar manner to reduced iron.

Fresh sods may be dug and placed in the pens twice a week. The little pigs will root in this and obtain sufficient iron. These

sods may be fortified by sprinkling with a solution of iron sulfate, made by dissolving one ounce of iron sulfate in a quart of water. This latter method of treatment is somewhat cumbersome, particularly in the winter months.

Creep Feeding

The small pigs will begin to eat solid feed by the time they are three weeks of age. This should be encouraged as the sow has passed her maximum milk production at this stage and cannot supply pigs with all the nutrients they need. The young pigs should be provided with a separate trough or small self-feeder (see figure 26), as a hungry sow may throw the small pigs against the edge of the trough or the wall and injure or even kill them. In addition, the sow's feed is usually not satisfactory for young pigs and they should have their own "creep" ration. If the pen is large enough, it is a splendid scheme to partition off a corner leaving an opening where the small pigs may go in for feed but where the sow cannot enter. A creep ration may be placed in this area and the small pigs may help themselves as they please. Water must be available for the suckling pigs at all times if they are to make the best use of creep feed rations.

Fig. 25.—A thrifty litter at the University Farm. Creep feeding is necessary as a supplement to the sow's milk to wean heavy litters.

The following creep feed mixture has been used successfully at the University Livestock Farm in recent years:

Wheat	50
Oat groats	21
Common sugar	10
Soybean oil meal	11
Fish meal	4.5
Iodized salt	0.5
Ground limestone	0.5
Antibiotic feed supplement (according to manufacturer's directions) approx.	0.5
Dried brewers' yeast (or other source of B vitamins)	2.0
	100 lb.

Vitamin A and D supplements to supply 200,000 I.U. and 20,000 I.U. respectively of vitamin A and D per 100 lb. ration.

We have observed that pigs weaned at 8 weeks of age will normally eat about 20 lb. each of this creep ration prior to weaning. Based on 1955-56 experiments, this quantity of creep feed ration will result in an extra 10 lb. of weight at weaning time, so that a relatively complex expensive ration is justified.

A few comments on creep feed rations are in order. They must be palatable, and that is the reason for the addition of 10% sugar. They should be high in energy and, in this regard, our experiments in 1954 indicated that wheat can be substituted for all of the oat groats with no real effect on results obtained. Fortification with necessary protein, minerals, vitamins and an antibiotic supplement is another prerequisite. A less complex creep ration consisting mainly of oat groats is useful if nothing else is available, but will not give results equal to a balanced ration.

Care must be taken not to use whole oats as small pigs cannot digest the coarse hulls, and in addition, the sharp hulls may cause digestive troubles. If all of the ingredients are finely ground, the use of pelleted creep feeds may encourage early consumption of the feed by the suckling pigs, although pelleting did not prove beneficial in experiments at the University of Alberta. If skimmilk is avail-

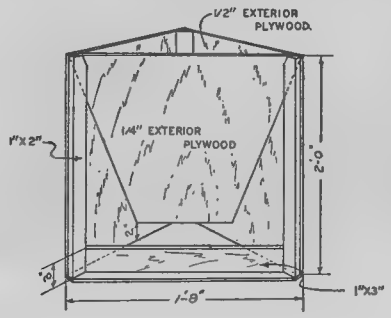

Fig. 26.—Self-feeder to be used in creep feeding.

able it should replace water for the young pigs, in which case the protein supplement may be reduced in the creep feed.

There are commercial fortified pig starting rations available which may be used to good advantage at this stage. The use of such "prestarters" or "starters" cuts down on the amount of labor involved in mixing feeds and avoids the necessity of purchasing and weighing out small quantities of a number of supplements.

Early Weaning: Orphan Pigs

Milk replacer products are available and may be used successfully in raising orphan pigs if a program of extreme sanitation is followed, and if the pigs get the first milk or colostrum from the sow. It seems unlikely that extremely early weaning prior to 2 weeks of age has a place in western Canada at present, so the use of these products will be limited largely to raising orphan pigs or extra pigs from large litters.

Pigs may be successfully weaned at 3 weeks of age by using a prestarter ration similar to the creep feed ration shown on page 63, or by using commercial prestarter rations. In 1955-56 experiments at the University, early weaned pigs averaged 35.4 lb. at 8 weeks compared to 38.3 lb. for pigs weaned at 8 weeks. A cost evaluation indicated that 3-week weaning resulted in cheaper production.

Despite this, early weaning cannot be recommended under practical conditions without reservation. Occasional litters may not respond to early weaning, particularly large litters where pigs average under 10 lb. weight at 3 weeks. If disease or other stress factors are present, early weaned pigs may be less able to cope with such adverse conditions. Quality of labor and management may be more critical where pigs are weaned early. Early weaning, however, does appear to be another step toward greater efficiency in hog production where management and facilities are good.

Castration

Male pigs intended for slaughter should be castrated by six weeks of age. Many farmers hesitate to castrate pigs, but the operation can be safely done if a few simple precautions are observed. Cleanliness, a sharp knife, a fairly generous incision coming well down on the scrotum to permit drainage, and a disinfectant in the wound are the main precautions.

Registration and identification of pigs are discussed on page 19.

FEEDING, MANAGEMENT AND HOUSING AFTER WEANING

Growing Pigs

If two litters per year are to be raised, pigs should be weaned at eight weeks of age. Earlier weaning may be practised as discussed on page 64.

The weanling stage is the critical period in the pig's life, and a special effort must be made to carry the young pigs over from the mother's milk period of his existence to a point where his digestive organs become accustomed to large amounts of solid food. **If a sudden change is made to a feed mixture which is very coarse in texture or is seriously lacking in the essentials mentioned, digestive disturbances are apt to develop, resistance to infection will be lowered and serious losses may follow.**

If the pigs have been well acquainted with a good combination of feeds before weaning (preferably by the use of a "creep"), the chances of a weaning set-back will be avoided to a large extent.

Grains

Farm-grown grains have been found satisfactory as the basis of a ration for weanling pigs. Since the small pigs cannot handle much bulk, oats should be restricted to 25% of the ration. If hull-less or sifted oats are available these may be fed at higher levels. In this

Fig. 27.—A typical pig suffering from enteritis such as might be caused by high fiber rations as well as other nutritional and non-nutritional causes. Diarrhea is an accompanying symptom.

connection the results, shown in Table X, of an experiment conducted at the University Farm in the spring of 1948 are of interest.

TABLE X.—OATS vs. BARLEY FOR PIGS AFTER WEANING

	GROUP 1	GROUP 2
	Oats ..... 70 Barley ..... 15 Supplement 15	Oats ..... 15 Barley ..... 70 Supplement 15
Number of pigs	7	7
Number of days on experiment	51	51
Av. initial weight ..... lb.	26	26
Av. final weight ..... lb.	59	64
Av. daily gain ..... lb.	0.65	0.76
Feed req'd. for 100 lb. gain ..... lb.	319	306

The fiber content of the 'oat' ration fed to Group 1 was 9% as compared to 6.5% for the 'barley' ration of Group 2. As shown in the above table, weanling pigs fed a ration containing 70% barley grew faster and made more economical use of their feed than those fed a ration containing 70% oats. The proportion of oats, barley and wheat may be altered slightly one way or other without danger. Oats and barley should be ground fairly finely for weanling pigs but wheat should be left in rather a sharp gritty state.

Protein Supplements

Skimmilk and fresh buttermilk are good substitutes for the mother's milk, but when these are not available, a properly blended protein-mineral-vitamin mixture will serve as a good replacement for milk at this stage.

The supplement may be mixed with the grain at a rate of 15 lb. in 100 lb. of feed mixture and kept at this level until the pigs reach a weight of around 110 lb. when it should be reduced to 8% (see page 46 for further details). Alfalfa meal or good quality ground hay at a level of 5% of the ration is an excellent addition to help supply protein, minerals and vitamins. Pasture in season can be used as discussed on page 47.

To indicate the advantage of using some form of substitute when milk is not available, Table XI is presented. Three groups of pigs were included in an experiment during the winter of 1939-40 and checked through the after-weaning stage, one group getting grain alone, one tankage as a milk substitute and one skimmilk. A mixed protein supplement would probably have given results comparable to those obtained with skimmilk.

TABLE XI.—SUPPLEMENTS FOR PIGS AFTER WEANING

	GROUP 1 Grain Alone	GROUP 2 Grain Tankage	GROUP 3 Grain Skimmilk
Number of pigs	8	8	8
Average daily gain during 6 weeks after weaning ..... lb.	0.34	0.67	1.01

Mineral Supplements

If weanling pigs are receiving supplements along the lines suggested, it will not be necessary to feed mineral mixtures. Such feeds contain both protein and mineral and the feeding of large amounts of additional mineral will prove of no value. There is, of course, no harm in self-feeding some simple mineral mixture (see page 43) at the weanling stage. Zinc (see page 43) should be in all rations at this stage to prevent parakeratosis.

Vitamin Supplements

If the pigs are weaned during the late fall, winter or early spring months, and especially if confined to the piggery, it is advisable to feed them some source of vitamin A and D up to at least 100 lb. in weight. This will assist in preventing symptoms of vitamin D deficiency (crippling) and vitamin A deficiency (poor growth, staggering and dizziness) and may help in improving resistance to infection (see page 43). Animals to be saved for breeding stock should receive a vitamin A and D supplement continuously.

Antibiotic Supplements

Vitamin B_{12}-antibiotic feed supplements or antibiotic supplements are usually very useful in promoting increased rate of gain in weanling pigs up to 110 lb. in weight. When fed past that stage they may be detrimental to the quality of the bacon carcass and are less economical than during the growing period. The results of a typical experiment conducted at the University of Alberta in the summer of 1950 to study the addition of an antibiotic supplement to 2 growing rations are given below:

TABLE XII.—ANTIBIOTIC SUPPLEMENTATION OF GROWING RATIONS

	GROUP 1	GROUP 2	GROUP 3	GROUP 4
	Mixed animal-vegetable protein	As 1 plus antibiotic	Vegetable protein	As 3 plus antibiotic
No. of pigs	7	7	7	7
No. of days fed	84	70	96	70
Av. initial weight lb.	31	31	31	31
Av. final weight lb.	123	123	129	123
Av. daily gain lb.	1.10	1.32	1.02	1.31
Av. daily feed lb.	4.2	4.6	3.5	4.0
Feed req'd. for 100 lb. gain lb.	378	347	344	307

With unthrifty or "runty" weanling pigs phenomenal increases in rate and efficiency of gain are often obtained by the use of antibiotics. Experiments at the University of Alberta have resulted in increased rate of gain of as much as 85% by adding antibiotics to pig starter rations for unthrifty pigs. The use of antibiotic feed supplements in "creep" rations may, in turn, prevent many of these runts occurring, and help to lower the incidence of scouring. Details of the proper use of antibiotic supplements are given on page 44.

Method of Feeding

In our experience, young pigs of the proper bacon type may be hand-fed or self-fed right from weaning time. In some cases free-choice feeding may prove economical. The system which will be followed may depend upon the factors which were discussed on page 51. A system of self-feeding is being followed very satisfactorily under our method of management at the University and we are inclined to recommend this method when any large number of pigs is to be raised. The number of pigs per self-feeder hole or per linear foot of self-feeder should not exceed the following:

	On drylot	On pasture
Weaning to 75 lb.	4	5
75 lb. to market	3	4

For hand-feeding, the length of the trough per pig should be:

Weaning to 75 lb.	.75 ft.
75 lb. to market weight	1.25 ft.

In mixing feed for young pigs, care should be taken to add supplements in the proportions recommended on the basis of experimental work. It is a good plan to check a few mixes by actual weighing of the feeds and then follow these proportions consistently. The addition of supplements greatly in excess of recommendations, sudden changes in mixtures or improper mixing may lead to digestive troubles.

A satisfactory feeding program can be worked out by purchasing a commercial starter and then mixing growing and finishing rations using home-grown grains and purchased concentrate.

Water

If possible, water should be kept in front of the pigs at all times during the summer, as insufficient water will lower gains. The automatic waterer shown in figure 28 makes provision for a steady water supply. A concrete platform is advisable to prevent formation of a mud wallow.

Worm Treatment

Shortly after weaning it is advisable to treat pigs for intestinal round worms which are prevalent in Alberta hogs. One or two months before farrowing the sow may be treated for worms.

For control to be logical it is necessary to know something of the life history of the parasite. The adults in the intestine lay numerous eggs which pass out with the manure, contaminating the soil, feed utensils and pastures. These eggs or ova are swallowed by animals with their feed, and hatch into larval worms which, before becoming established as adult worms in the intestine, migrate through the

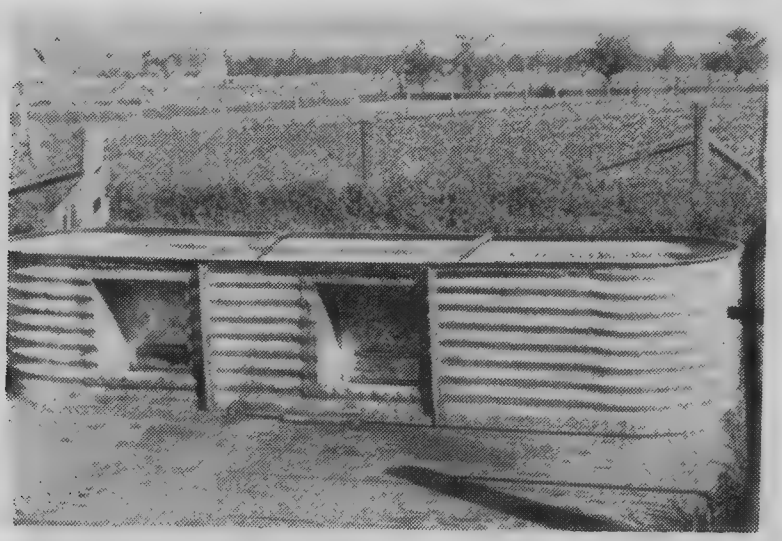

Fig. 28.—An automatic waterer reduces labor and keeps water in front of pigs during the summer months.

lungs and liver, causing extensive damage which may result in coughing and pneumonia.

The adult worm living in the intestinal tract causes irritation and damage to the intestinal wall, resulting in enteritis and unthriftiness, and rendering the animal more susceptible to diarrhea.

Well fed, healthy swine sometimes carry heavy worm infestation without showing any marked disturbances, a fact which again points to the advisability of proper feeding and management in disease prevention. A study of the life history of the worm makes it easily understandable why sanitation is so necessary in the control of this parasite. To prevent recontamination, practices outlined on pages 47 and 58 should be followed.

There are several methods of treatment.

1. *Sodium Fluoride*—Weigh the amount of grain or chop that is fed to the pigs in one day. To this is added one per cent by weight of sodium fluoride. Care should be taken to mix it thoroughly and it must be fed dry. Pigs may be given water to drink between meals. Care must be taken in measuring the sodium fluoride for it is toxic, and poisoning may occur.

2. *Cadmium oxide compounds*—Commercial preparations containing cadmium oxide are available for worm treatment and as they are much less toxic than sodium fluoride they are safer to use. Directions for use will be found on the container.

New worm remedies are becoming available at frequent intervals, the most recent being piperazine derivatives, so that it is advisable to check on recent advances in this field.

Finishing Feeder Pigs

It is important that the finishing process be regulated so that the pigs are properly finished at weights of 190 to 210 lb. on the farm, so as to yield carcasses of 140 to 170 lb. in weight. Pigs which are underfinished are objectionable as they yield flabby undesirable carcasses. Overfinish, which is more common, results in excess waste fat and lower grades.

Fig. 29.—Spring farrowed pigs may make good use of pasture as a supplement to grain rations during the summer months.

Rations

Oats, barley, wheat and rye may all be used in working out suitable feed combinations for finishing pigs. Barley, when available, may form a large part of the finishing ration. Wheat has given good results in our finishing tests and can be used with barley or as a substitute for it. In an experiment conducted at the University of Alberta during the winter of 1951-52 rations containing No. 5 or feed wheat resulted in lower-grading carcasses than were obtained on a barley ration. Rye is not relished by pigs, but can be utilized when mixed as not over 50%, with other grains. In one of our experiments a mixture of equal parts of oats, barley and rye gave very good results. Oats are a relatively inefficient finishing feed if they form over 25% of the ration. As pointed out on page 35, finishing rations high in oats or diluted with other fibrous feeds do tend to yield high quality carcasses. Results of a trial conducted in 1955-56 indicated that 10% or 25% alfalfa meal or 25% ground good quality hay in the finishing ration all produced

high grading carcasses. If efficiency of feed utilization and cost of production are to be maintained reasonably well, not over 10% of these latter diluents should be added to the ration.

When pigs are finished in drylot, a supplement may be fed at the rate of 8% to good advantage. Grain mixtures suggested for finishing pigs are as follows:

Oats 1 part **Barley 3 parts**	**or**	**Oats 2 parts** **Wheat 3 parts**	**or**	**Wheat 1 part** **Oats 1 part** **Barley 2 parts**

Suitable Rations for Winter Pigs

In planning feed mixtures for winter pigs it is well to keep the following general principles in mind: (1) The pig fed during the winter months cannot make use of pasture or green feed in the same sense as the pig farrowed during the spring or summer months and, therefore, cannot help to balance his own ration; (2) Gains should be such that most of the pigs may be marketed at a reasonable age so as to keep down overhead costs.

Unless the ration of the winter pigs is well balanced, gains are likely to be slow and comparatively expensive. Pigs badly fed during the winter months can "pile up a heavy feed bill" and prove a liability rather than an asset.

Feeding practices discussed on pages 38 to 47 apply particularly to winter pigs when no pasture is available. Winter pigs will use a considerable volume of water, and a constant supply must not be neglected. An experiment at the University of Alberta indicated that there was no advantage to warming water for pigs. Despite this, a water heater may simplify watering in the winter when freezing conditions prevail. Otherwise, pigs must be watered 3 times daily under these conditions.

Feed to Proper Market Weight

In order to indicate the rate of gain which may be expected during the finishing period and at the same time to suggest the advantage in economy and avoiding overfinish which results from marketing pigs at around the 200 lb. mark as compared with carrying them to heavier weights, the following tables showing the results of an experiment conducted in 1953-54 are presented.

It will be seen in Table XIII that while the three groups of pigs made very good gains, the pigs which were fed out until they averaged 225 lb. in weight yielded no grade A carcasses mainly because they were over the 170 lb. weight limit and because they were too fat to meet the grade A requirements. In the case of the pigs marketed at 180 lb., several carcasses were under the required

grade A weight range of 140 lb., although in other respects they were very desirable.

TABLE XIII.—RATE OF GAIN AND GRADE OF PIGS MARKETED AT DIFFERENT WEIGHTS

	Average market weight, lb.		
	180	205	225
No. of pigs in lot	8	8	8
Av. daily gain ..... lb.	1.31	1.42	1.42
Av. hot carcass wt. ..... lb.	141	159	177
Carcass grades:			
A	4	3	....
B-1	4	4	2
B-3	....	....	6
C	....	1	....
Average fat:			
Shoulder ..... in.	1.9	2.0	2.2
Back ..... in.	0.9	1.1	1.2
Loin ..... in.	1.3	1.6	1.7

TABLE XIV.—SUMMARY OF RATE OF GAIN, FEED CONSUMPTION AND FEED EFFICIENCY OBTAINED DURING DIFFERENT STAGES OF GROWTH

Weight range lb.	Av. daily gain lb.	Av. daily feed lb.	Feed required per 100 lb. gain lb.
50- 75	1.12	4.0	361
75-110	1.35	5.4	396
110-150	1.48	6.5	439
150-185	1.47	6.6	446
185-205	1.51	6.8	450
205-225	1.58	7.5	475

Table XIV summarizes the gain, feed consumption and feed efficiency of the pigs in this experiment. As a pig becomes heavier it requires more feed to make a pound of gain even though it tends to gain faster. This experiment, together with an experiment conducted in 1939, indicates that the largest net returns on pigs will be received if they are marketed at around 200 lb. and not over 210 lb. liveweight.

Summary of Feeding Suggestions

The major nutrient requirements of swine on the basis of percentage of the feed are summarized in Table XV.

TABLE XV.—NUTRIENT REQUIREMENTS OF SWINE ON THE BASIS OF PERCENTAGE OF THE FEED

Type of Ration Period	Creep-prestarter to 40 lb.	Starter to 75 lb.	Grower to 110 lb.	Finisher to market	Sows	
					Pregnancy	Lactation
Expected feed consumption daily ..... lb.	1.5-2.0	4.0	6.0	7.0	6-8	12-18
Crude protein ..... %	18-20	16	15	13	15	15
Calcium ..... %	0.8	0.65	0.65	0.55	0.6	0.6
Phosphorus .... %	0.6	0.45	0.45	0.33	0.4	0.4
Salt (iodized) .. %	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin A I.U./lb.	500	500	500	500	1250	1250
Vitamin D I.U./lb.	90	90	90	....	90	90

In order to bring together some of the suggestions offered earlier in this bulletin, the feeding plan in Table XVI is offered. These suggested rations meet the above requirements under average Alberta conditions, when skimmilk is not available.

TABLE XVI.—SUGGESTED RATIONS FOR SWINE

		May be combined			Sows	
	Creep-Prestarter	Starter	Grower	Finisher	Pregnancy	Lactation
Barley and/or wheat .....%		52-85	53-88	42-67	18-38	38-63
Oats .....%		0-25*	0-25	25-50*	40-50	25-50
Alfalfa meal or hay .....%	see	0- 5	0-10	0-10	10-30	.....
"35 to 40% Concentrate" or complete supplement** %	page (63)	15-18	12	8	12-15	12-15

*Oat groats may be fed at much higher levels in the starting period. Use of oats in the finishing period is discussed on page (35).

**Levels on good pasture may be reduced by one-half.

BUILDINGS AND SHELTER FOR PIGS

Acknowledgment is made of the assistance of F. V. MacHardy, Department of Agricultural Engineering, in preparation of this section as well as earlier sections of the bulletin dealing with buildings and equipment.

The main prerequisite for successful winter pig production is the provision of warm, dry, draft-free quarters.

Centralized Piggeries

On the average farm, year around housing can most economically be provided by a centralized house which provides for both farrowing and feeder pens. The basic requirements for a satisfactory building of this type are: a suitable pen and feed storage arrangement for efficient management; adequate warmth; and sufficient ventilation.

Except in very small hog houses, there are usually two rows of pens, one row on each side of a central alley. Each pen should provide space for feeding and watering, a raised sleeping platform, and a litter alley.

The location of the litter alley is the basic difference in the two most common types of piggeries. The distinguishing feature of the Danish-type piggery is the outside litter alley. Piggeries designed along these lines have proven reasonably satisfactory. A criticism has been that the building is wider and therefore more expensive than necessary due to the addition of the litter alleys. A second criticism has been that freezing is a problem in the litter alleys during severe weather due to their placement against the outside walls. A second type of piggery makes use of the space between the troughs and the sleeping platforms as a litter alley. This plan avoids the faults associated with the Danish floor plan.

A satisfactory size for feeder pens is about 100 square feet. Each market weight hog requires about 15 square feet of space, so a pen of 100 square feet will carry the average-sized litter until they are ready for market.

Feeder pen floors are usually made of concrete. The difficulty of keeping plank floors clean makes the use of such floors questionable.

Colony Houses

For summer farrowed pigs, colony houses are recognized as an alternative to the more expensive centralized piggery.

While pigs farrowed during the fall and winter months require adequate housing during the nursing period, they do not require elaborate shelters during the growing and finishing stages. At the University of Alberta colony houses have proven reasonably satisfactory for growing and finishing winter pigs, with the gable-type house shown in Fig. 30 being used extensively as a shelter. Shed-type colony houses are somewhat cheaper to construct and equally useful.

Fig. 30.—Colony houses of the above type have proven useful for growing and finishing pigs. A heavy sack should be hung over the door in the winter months.

The 6′×8′ colony house will accommodate from 8 to 10 pigs comfortably. In locating the colony houses for the winter they should face away from the prevailing wind and be crated and banked to the eaves with straw. A heavy burlap sack hung over the door breaks the wind and provides suitable protection for the doorway.

During the winter of 1936-37 an experiment was conducted to compare the feeding of fall pigs sheltered in colony houses as shown in Fig. 30, with others sheltered in the centralized piggery with artificial heat provided. The two groups of pigs were similar in breeding and were fed a similar ration.

The results of the experiment are shown in the following table:

TABLE XVII.—METHOD OF HOUSING FALL PIGS

	LOT I	LOT II
	Piggery, Heated with Stove	Colony House
No. of pigs in lot	5	5
No. of days on experiment	112	128
Av. initial weight lb.	44	42
Av. final weight lb.	212	207
Av. daily gain lb.	1.50	1.29
Feed req'd. for 100 lb. gain:		
Grain lb.	327	353
Supplement lb.	43	48
Total lb.	370	401

It is to be noted that the pigs fed in the piggery where some heat was provided made their gains more quickly and with less feed. At the same time, the pigs fed in the colony houses made satisfactory gains. It would seem that while the permanent piggery has some definite advantage over the colony house as housing for fall pigs, the colony house, with outdoor run, will render good service.

Heating and Ventilation of Piggeries

A brief discussion of ventilation, insulation and heating of the centralized piggery is given, as these are three essentials for successful functioning of a piggery. **Details for construction of a General Purpose Hog Barn as well as more specific information on ventilation and insulation may be obtained by writing to the Department of Animal Science or Department of Agricultural Engineering, University of Alberta.**

Ventilation

The importance of good ventilation cannot be over-emphasized. Pigs are particularly susceptible to ailments arising out of a damp environment, and it is very important that the air in the piggery be kept comparatively dry. Ventilation removes the moisture given off by the hogs, and is the only practical way of keeping a piggery dry.

There are two types of ventilating systems used, both of which are satisfactory. These are mechanical or fan ventilation, and natural draft ventilation.

Fan Ventilation

Where power-line electricity is available, the use of fan ventilation is recommended. In this system an exhaust fan draws the warm, damp air from the building, and fresh air enters through small inlet openings located around the walls near ceiling level. Either one or two fans may be used. If a single fan is used, its capacity should be about 60 c.f.m. (cubic feet per minute) for each 1000 pounds of hogs in the piggery. As an example, if a piggery housed fifty 200-pound hogs, a 600 c.f.m. fan would be required. If a single

fan is used, it should be provided with an manually controlled shutter or louvre, so that the output can be regulated by opening or closing the louvre.

In a two-fan system, one fan runs continuously, while the other is thermostatically controlled to cut in at outside temperatures of 20 to 25 degrees. A two-fan system makes it possible to automatically control the ventilating rate. With low outside temperatures a small amount of ventilating air is required to control the humidity. As the outside temperature rises and more ventilating air is required, this outside thermostat automatically starts the second fan. In a two-fan system, the continuously running fan should have a capacity of 30 c.f.m. per 1000 pounds of hogs, while the thermostatically controlled fan should have a capacity of 40 c.f.m. per 1000 pounds of hogs. The intermittent fan should be provided with an automatic louvre placed on the inside of the fan to prevent back drafts when the fan is not operating.

The exhaust fan, or fans, should be located on the side of the piggery away from the prevailing winds.

Natural Draft Ventilation

If power-line electricity is not available, the exhaust fan may be replaced by a single out-take flue. The size of the flue should be designed for the maximum number of hogs a piggery will hold. When not full, the ventilating rate can be reduced by partially closing the control slide.

Table XVIII gives the cross-sectional area of the out-take flue.

TABLE XVIII.—FLUE AREAS NEEDED FOR VARIOUS NUMBERS OF MARKET WEIGHT HOGS

Number of 200 lb. hogs in piggery	Height in feet from floor to ridge of piggery		
	20	25	30
	Flue area (square inches)		
20	215	180	160
30	260	220	200
40	345	290	265
50	430	362	318
60	518	435	382
70	604	507	445
80	690	580	510
90	776	654	573
100	864	762	637

The out-take flue may be located at any convenient place in the building, usually in the corner of a pen. It must be well insulated, and should run straight up without any bends or offsets.

Fresh air inlets similar to those mentioned under Fan Ventilation must be provided.

Insulation

It is very important that an insulating material be placed in the walls and ceiling of a piggery. Insulation serves two purposes. It

retains the heat given off by the hogs, and so results in a much warmer, more comfortable building. It also raises the inside surface temperature of the walls and ceiling, thus helping to eliminate condensation and frost from forming on these surfaces. There is no question that a farmer is many times repaid the original cost of the insulation, both in fuel savings and in better animal health.

Dry planer shavings or commercial insulation can be used satisfactorily. The insulation must be protected from moisture. This is accomplished by placing vapor barrier paper over the studs and ceiling joists under the inside sheathing. As an added protection louvres should be provided in the gable ends of the building to allow free air circulation in the attic.

Heating

Hogs do not give off enough heat to maintain a desirable building temperature during severe weather such as is encountered in Alberta winters. For this reason supplementary heat is required in a piggery.

Various types of heaters may be used but a circulating type of heater is the most effective in distributing the heat through the entire building. The heater may be located at any convenient location in the piggery; however, it should preferably be as close as possible to the farrowing pens.

Some piggeries have the heating unit located in a pit or basement under the building. This location is desirable if an air space is provided under the floor. It is very effective in providing warm floors.

Shade

If natural shelter is not available in the form of brush, colony houses work well for summer shade. Shelter should be convenient to where the pigs feed, or they may spend too much time in the sun and suffer from sunburn or sunscald (see page 48).

Building Plans

A number of plans dealing with swine buildings and equipment may be obtained by writing to the Department of Agricultural Engineering, University of Alberta, Edmonton.

VETERINARY SERVICES

It is strongly recommended to all swine producers to obtain the advice and services of a Veterinarian when sickness appears in their hogs. This is impossible in some districts of Alberta, but where such services are available it is in the producer's own interest to have professional advice.

A Veterinary Laboratory is maintained in Edmonton by the Alberta Department of Agriculture as a public service. Its facilities are available to all livestock producers in the Province, free of charge. When animals are sick or dying a specimen should be submitted to the Laboratory for examination. It is important that animals should arrive at the Laboratory as soon after death as possible. A live sick animal is preferable. If dead, the carcass should be packed in ice and sawdust, and addressed to the **Alberta Veterinary Laboratory, Department of Agriculture, Edmonton, Alberta.**

The following pamphlets are available from the Department of Agriculture, Edmonton:

Diseases of Suckling Pigs
Infectious Rhinitis
Swine Erysipelas
Swine Parasites

TABLE XIX—GESTATION TABLE FOR BROOD SOWS (based on 112-day pregnancy period)

Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due	Date Bred	Date Due
Jan.	Apr.	Feb.	May	Mar.	June	Apr.	July	May	Aug.	June	Sept.	July	Oct.	Aug.	Nov.	Sept.	Dec.	Oct.	Jan.	Nov.	Feb.	Dec.	Mar.
1	23	1	24	1	21	1	22	1	21	1	21	1	21	1	21	1	22	1	21	1	21	1	23
2	24	2	25	2	22	2	23	2	22	2	22	2	22	2	22	2	23	2	22	2	22	2	24
3	25	3	26	3	23	3	24	3	23	3	23	3	23	3	23	3	24	3	23	3	23	3	25
4	26	4	27	4	24	4	25	4	24	4	24	4	24	4	24	4	25	4	24	4	24	4	26
5	27	5	28	5	25	5	26	5	25	5	25	5	25	5	25	5	26	5	25	5	25	5	27
6	28	6	29	6	26	6	27	6	26	6	26	6	26	6	26	6	27	6	26	6	26	6	28
7	29	7	30	7	27	7	28	7	27	7	27	7	27	7	27	7	28	7	27	7	27	7	29
8	30	8	31	8	28	8	29	8	28	8	28	8	28	8	28	8	29	8	28	8	28	8	30
	May		June	9	29	9	30	9	29	9	29	9	29	9	29	9	30	9	29		Mar.	9	31
9	1	9	1	10	30	10	31	10	30	10	30	10	30	10	30	10	31	10	30	9	1		Apr.
10	2	10	2		July		Aug.	11	31		Oct.	11	31		Dec.		Jan.	11	31		Feb.	10	2	10	1
11	3	11	3	11	1	11	1		Sept.	11	1		Nov.	11	1	11	1		Feb.	11	3	11	2	11	2
12	4	12	4	12	2	12	2	12	1	12	2	12	1	12	2	12	2	12	1	12	4	12	3	12	3
13	5	13	5	13	3	13	3	13	2	13	3	13	2	13	3	13	3	13	2	13	5	13	4	13	4
14	6	14	6	14	4	14	4	14	3	14	4	14	3	14	4	14	4	14	3	14	6	14	5	14	5
15	7	15	7	15	5	15	5	15	4	15	5	15	4	15	5	15	5	15	4	15	7	15	6	15	6
16	8	16	8	16	6	16	6	16	5	16	6	16	5	16	6	16	6	16	5	16	8	16	7	16	7
17	9	17	9	17	7	17	7	17	6	17	7	17	6	17	7	17	7	17	6	17	9	17	8	17	8
18	10	18	10	18	8	18	8	18	7	18	8	18	7	18	8	18	8	18	7	18	10	18	9	18	9
19	11	19	11	19	9	19	9	19	8	19	9	19	8	19	9	19	9	19	8	19	11	19	10	19	10
20	12	20	12	20	10	20	10	20	9	20	10	20	9	20	10	20	10	20	9	20	12	20	11	20	11
21	13	21	13	21	11	21	11	21	10	21	11	21	10	21	11	21	11	21	10	21	13	21	12	21	12
22	14	22	14	22	12	22	12	22	11	22	12	22	11	22	12	22	12	22	11	22	14	22	13	22	13
23	15	23	15	23	13	23	13	23	12	23	13	23	12	23	13	23	13	23	12	23	15	23	14	23	14
24	16	24	16	24	14	24	14	24	13	24	14	24	13	24	14	24	14	24	13	24	16	24	15	24	15
25	17	25	17	25	15	25	15	25	14	25	15	25	14	25	15	25	15	25	14	25	17	25	16	25	16
26	18	26	18	26	16	26	16	26	15	26	16	26	15	26	16	26	16	26	15	26	18	26	17	26	17
27	19	27	19	27	17	27	17	27	16	27	17	27	16	27	17	27	17	27	16	27	19	27	18	27	18
28	20	28	20	28	18	28	18	28	17	28	18	28	17	28	18	28	18	28	17	28	20	28	19	28	19
29	21	....	....	29	19	29	19	29	18	29	19	29	18	29	19	29	19	29	18	29	21	29	20	29	20
30	22	....	....	30	20	30	20	30	19	30	20	30	19	30	20	30	20	30	19	30	22	30	21	30	21
31	23	....	....	31	21	....	....	31	20	....	....	31	20	31	21	....	....	31	20	....	....	31	22	31	22